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FINANCIAL AND INSTITUTIONAL ARRANGEMENTS FOR WASTEWATER MANAGEMENT - DENVER SMSA

WILBUR SMITH AND ASSOCIATES

PREPARED FOR
ENVIRONMENTAL PROTECTION AGENCY

APRIL 1973

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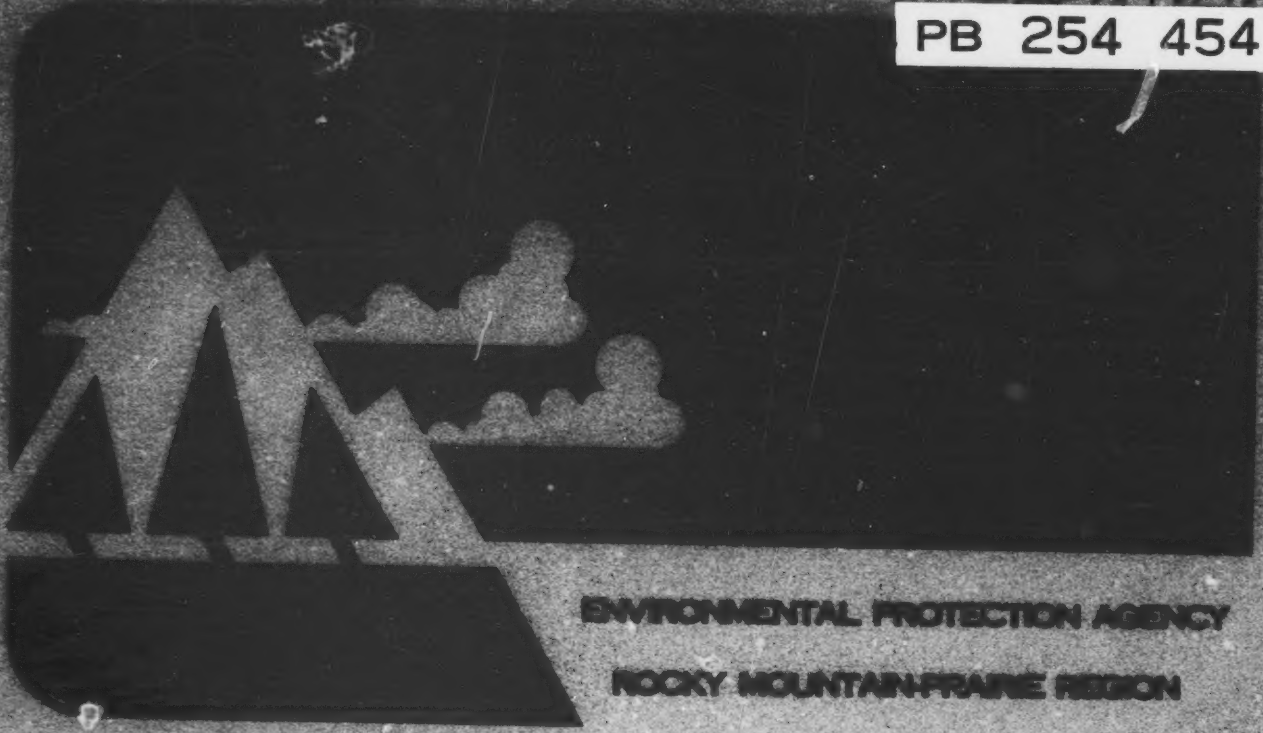

ENVIRONMENTAL PROTECTION AGENCY

ROCKY MOUNTAIN-PRAIRIE REGION

REGION VIII

FINANCIAL AND INSTITUTIONAL ARRANGEMENTS FOR WASTEWATER MANAGEMENT - DENVER SMSA

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FINANCIAL AND INSTITUTIONAL ARRANGEMENTS FOR WASTEWATER MANAGEMENT - DENVER SMSA

by

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Denver, Colorado 80222

for the

ENVIRONMENTAL PROTECTION AGENCY

Region VIII

Contract # 68-01-0734

April 1973

EPA Review Notice

This report has been reviewed by the Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement of recommendation for use.

ABSTRACT

Field studies and office research were conducted to determine the existing institutional arrangements and financial practices of sixteen wastewater management agencies within the Denver SMSA. Data was compiled for each of the agencies which portrayed types and amounts of current revenues and expenditures, projected revenues and expenditures, and the manner in which various classes of expenditures are currently financed.

Legal research revealed a wide range of institutional and financial arrangements available to areas and units of government in the provision and operation of wastewater facilities. No optimum form of institutional or financial arrangements was sought, but various criteria are suggested by which the selection might be made. Ample legal authority appears to exist for meeting wastewater management needs within the Denver SMSA provided that the selection of appropriate arrangements can be made by the electorate.

It was found that policy and administrative considerations in selecting financial arrangements are more critical to satisfactory solution of needs than are statutory considerations.

Further it was found that the scale and scope of the selected jurisdiction was more critical than the precise form of institutional arrangement. Strengthened roles for state, county and municipal governments are foreseen, as well as a continuance of the important function performed by the Denver Regional Council of Governments.

This report was submitted in fulfillment of Contract No. 68-01-0734 under the sponsorship of the U. S. Environmental Protection Agency.

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Section I

SUMMARY OF FINDINGS AND RECOMMENDATIONS

Findings

1. Sufficient enabling authority is contained in the Colorado statutes to permit the adoption, modification and effective use within the Denver SMSA of virtually any institutional form for wastewater management which the citizens may elect.

2. With minor amendments, sufficient enabling authority is contained in the Colorado statutes to permit the establishment of adequate and equitable financial arrangements under whatever institutional form may be selected.

3. Continuing federal grant assistance is needed to finance major wastewater treatment and disposal capital improvement needs in the Denver SMSA to meet increasing demands and standards for treatment; local revenues are found generally sufficient to meet current operating needs anticipated.

4. A significant variation exists in current financial and institutional arrangements of wastewater agencies in the Denver SMSA, which extends to the level of performance of financial planning and management by these agencies.

5. Financial and physical planning by the smaller wastewater agencies is hampered by lack of scale of the jurisdiction, the absence of comprehensive jurisdiction, and the inability to identify long-range needs.

6. The accounting and operating records of certain wastewater agencies are not in a form which permits ready identification or comparison of cost components and revenues by class and category of user, or analysis of rate and charge schedules.

7. With the exception of Metropolitan Denver Sewage Disposal District No. 1, formal inter-governmental institutional arrangements are not being employed as effectively or as fully as is authorized by statute, or indicated by the circumstances.

8. The number of agencies engaged in wastewater operations in the Denver SMSA renders difficult the formulation and implementation of a coherent plan for wastewater management for the region.

Recommendations

1. That the Colorado General Assembly make modifications in various statutes to facilitate wastewater debt incurrence and administration.

2. That the State of Colorado through its administrative departments and agencies provide additional assistance to wastewater agencies through the maintenance of data services, and the rendering of advice and assistance in financial policy and management, including accounting, budgeting, rate formulation, capital improvement programming, and debt administration.

3. That under appropriate circumstances, county governments assume a larger role in wastewater management, primarily as an interim financing agency and in administration of the Special District Control Act.

4. That all current rate and charge schedules be reviewed and revised, on a continuing basis, to insure their adequacy and equity, particularly with respect to non-domestic users; that financial and operating records be maintained in a form which facilitates this review and analysis.

5. That special purpose districts, of limited scope, be actively discouraged, and the formation or expansion of general purpose agencies or governments be fostered.

6. That wastewater planning and management be conducted only within the context, if not the framework, of areawide planning and management of other governmental services.

7. That through the auspices of the Denver Regional Council of Governments, or similar agency, the entire Denver SMSA become involved in a massive effort to define wastewater goals and needs for the region, delineate logical service areas, establish criteria for selection of institutional approaches, and proceed with programs of formal and informal cooperative action to mobilize the full resources of the region to meet local and regional needs.

8. That fullest possible information be circulated to all wastewater agencies, and training sessions conducted, with respect to the content and impact of current and future guidelines promulgated by the Environmental Protection Agency.

Section II

STUDY GOALS AND OBJECTIVES

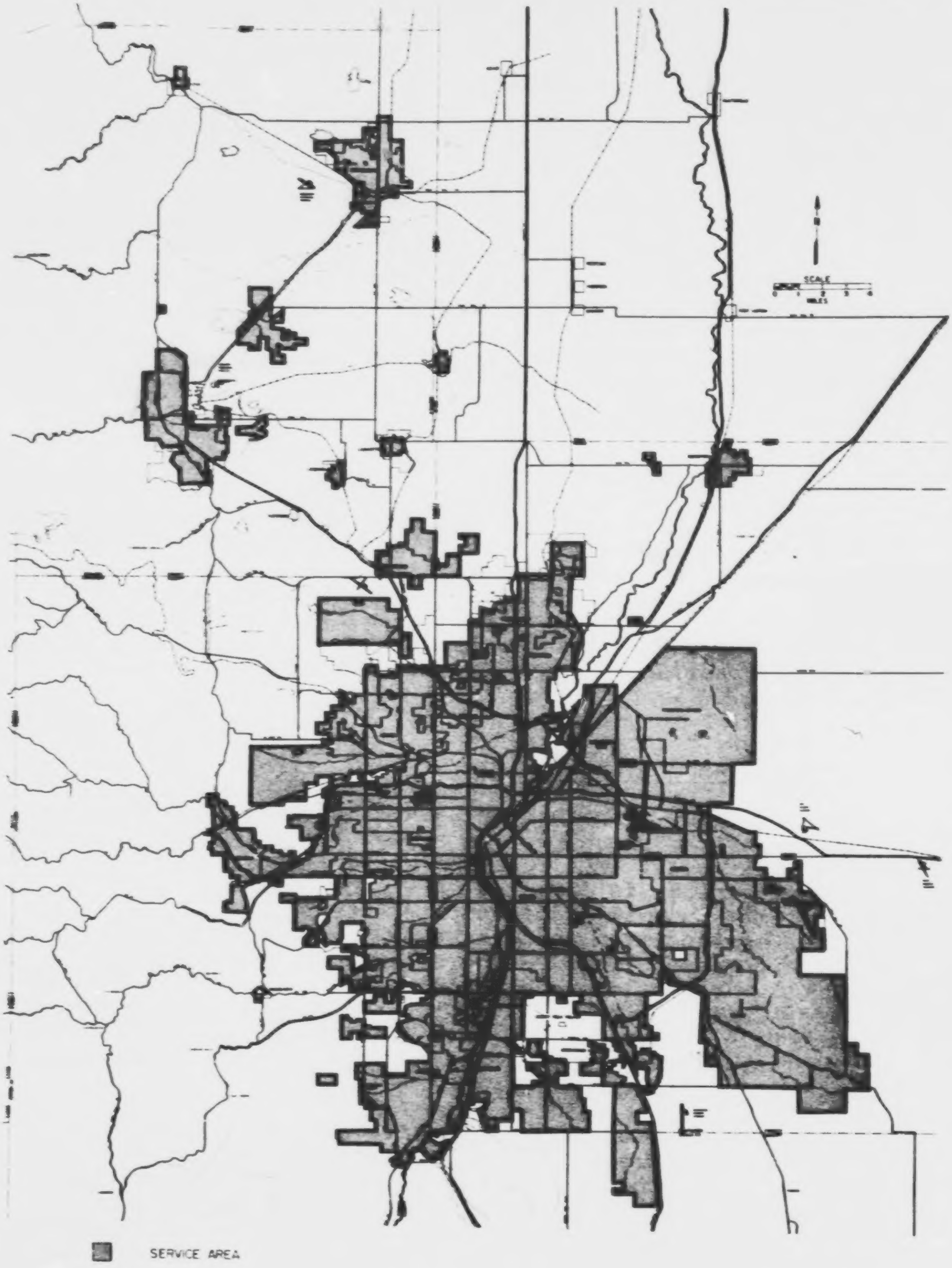
Several studies have previously been made of various aspects of wastewater and wastewater systems within the Denver Standard Metropolitan Statistical Area. Most of these studies have focused on inventories of wastewater facilities, definition of design capabilities, description of current and anticipated flows, and other engineering and physical aspects of sewage collection and treatment. While these studies have been beneficial in developing understanding of facility needs and problems, they have not been directed toward in-depth examination of financial and institutional aspects of wastewater management.

This study attempts to complement these past studies by developing the financial and institutional data and outlining alternative arrangements to present a broader base for decision on all aspects of wastewater service in the area. By means of such information it may be possible for individual jurisdictions to better evaluate the financial and institutional means for meeting wastewater needs, and for others to evaluate the total spectrum of wastewater services throughout the Denver area.

Study Goals and Objectives

Within the study area (Denver SMSA) there are more than one hundred agencies which provide sewage collection and/or treatment and disposal. The combined wastewater service areas of these agencies is depicted in Figure 1. These agencies range from very small sanitation districts and municipalities to large metropolitan agencies such as the City and County of Denver and Metropolitan Denver Sewage Disposal District Number 1. Some of these agencies perform full wastewater services including collection, treatment, and disposal functions, while others perform only a single or partial function, contracting with another agency for the additional functions required.

The great variety of organizational types and arrangements, and in financial measures employed, render a simple or uniform description of each of the financial and institutional arrangements quite impossible. The sheer number and complexity of existing institutional and financial arrangements has limited an objective regional approach to the problems confronting wastewater services in general, and each agency in particular.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WASTEWATER SERVICE AREA
DENVER SMSA

Wilbur Smith and Associates

SOURCE: DENVER REGIONAL COUNCIL OF GOVERNMENTS

FIGURE 1

The primary goal of this study is to provide data and insights which will define and delineate wastewater management constraints and opportunities within the Denver SMSA. As such, the study emphasizes the development of a financial and institutional data base.

However, the study is intended to provide more than an inventory of data and practices. The study has also sought to identify the current financial and institutional policies of the wastewater agencies; to examine the adequacy and suitability of current and possible alternative arrangements to meet future needs; and, to develop a comprehensive basis for seeking effectiveness, continuity, responsiveness and equity of financial and institutional arrangements on a local and regional basis. In the regional approach to wastewater management it is vital that there be full understanding of and sensitivity to the institutional and financial constraints upon local jurisdictions in meeting their assigned responsibilities. As such, institutional and financial constraints are examined and alternative solutions are explored which could lead to the minimization or elimination of existing and anticipated problems.

Scope of Work

The scope of work entailed the compilation of existing data, analysis of trends, practices, and constraints, evaluation of alternative arrangements, and preparation of findings and recommendations. No attempt was made to examine physical facilities nor the composition or components of wastewater itself. These are being investigated in separate but concurrent studies. For purposes of this study, the engineering and physical aspects of wastewater and wastewater operations are treated as "givens." Furthermore, no attempt has been made to prepare detailed recommendations that specific institutional forms for wastewater management be adopted, this being deemed beyond the auspices of Environmental Protection Agency. Rather, this study has sought to identify and delineate possible alternatives in such a manner as would facilitate decisions at the local and regional levels.

There are two additional studies currently underway which will complement this study. The Water Quality Management Planning Program, being undertaken by the Denver Regional Council of Governments (DRCOG) and its consultant, will explore and recommend specific institutional forms and the steps and procedures necessary to effect such forms. This study is expected to be completed by late 1973. The second study, entitled Lakewood, Colorado Water and Sewer Systems Unification, is also being performed by DRCOG and its consultant in conjunction with the City of Lakewood. This study, also scheduled for completion in 1973, details the legal and financial problems confronting consolidation efforts in a specific portion of the Denver area.

Study Methodology

It was recognized prior to the study being authorized that it would be impracticable to contact and analyze the operations of every agency dealing with wastewater in the five-county study area. With well over one hundred such agencies, such a plan would yield only superficial, inventory type information, except at unreasonable cost. It was therefore determined that an in-depth study of a selected sample of agencies, representative of the total spectrum of wastewater management in the Denver SMSA, would be preferable to studying every agency, and produce the desired study information.

The Denver Regional Office Environmental Protection Agency, together with representatives of the Denver Regional Council of Governments and its wastewater consultants, compiled an initial list of wastewater agencies which appeared to be representative of the many agencies engaged in wastewater services in the area. This consultant contacted each of these agencies and, with the concurrence of Environmental Protection Agency, further reduced the number of agencies to a total of sixteen agencies as provided in the Statement of Work for the project. These are constituted: nine cities and towns; six sanitation or water and sanitation districts; and one metropolitan sewage disposal district. A complete list of these agencies is shown on Table 1. These sampled agencies are deemed to be representative of the total universe of agencies in the study area from size, geographic, administrative, functional, type, and operational standpoints. The geographic location and relative size of each of these agencies is depicted on Figure 2. As shown, the major portion of the urban area is represented by the sixteen sampled agencies.

During the course of the study numerous personal contacts and in-depth interviews were held with representatives of each of the sixteen sampled agencies. Discussions were held with city managers, finance officers, wastewater agency superintendents, billing clerks, maintenance men and others, in an attempt to become thoroughly acquainted with relevant aspects of wastewater management. In addition, numerous follow-up contacts were made by telephone and correspondence. In all cases, agency officials evidenced sincere interest in the study and cooperated to the fullest extent possible. Contacts were also established with such agencies as the Denver

Table 1
LIST OF STUDIED WASTEWATER AGENCIES
Denver Standard Metropolitan Statistical Area
1972

MUNICIPALITIES (9)

City of Arvada
City of Boulder
City of Broomfield
City and County of Denver
City of Englewood
Town of Littleton
City of Longmont
City of Thornton
City of Westminster

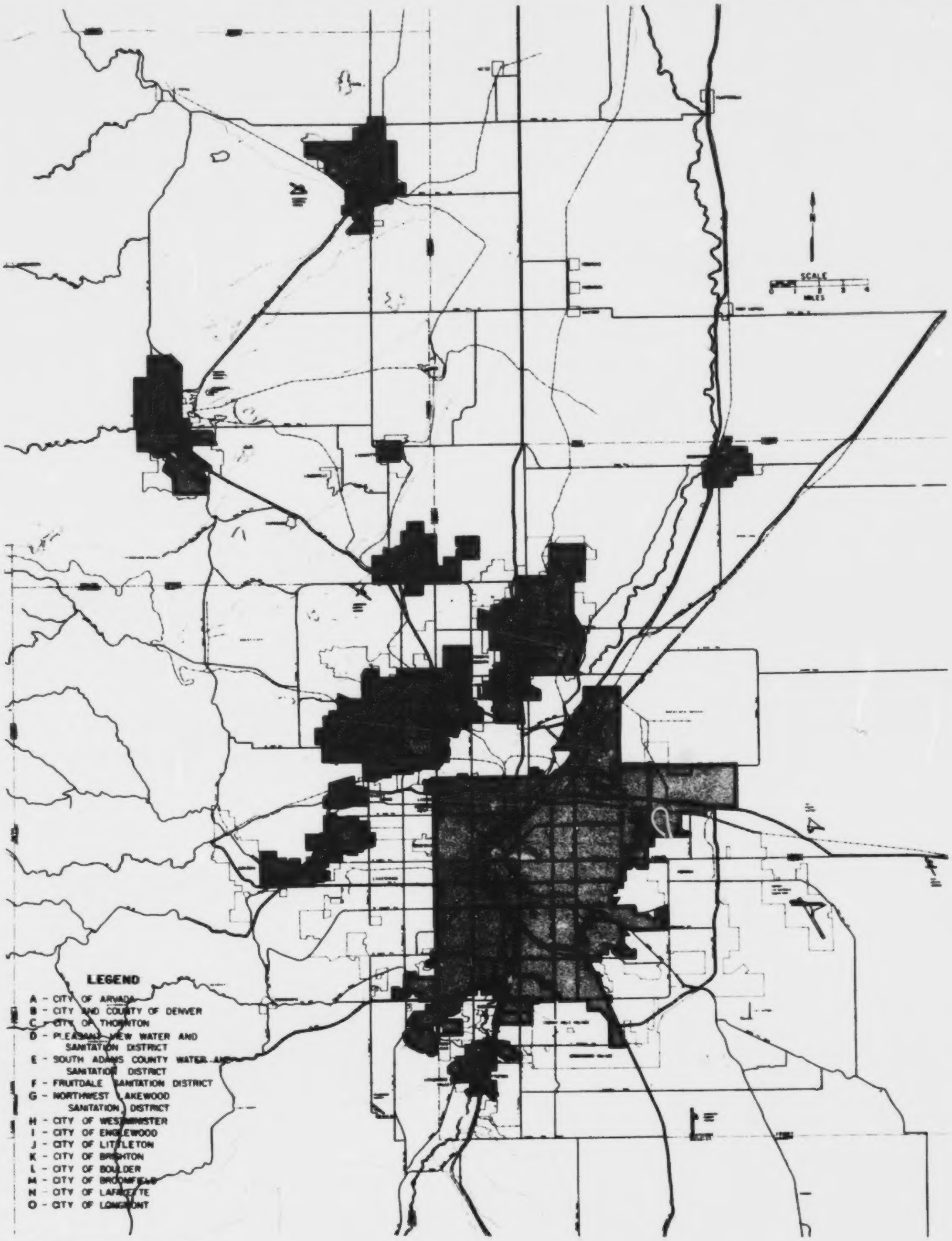
SANITATION DISTRICTS (6)

City of Brighton (a)
Fruitdale Sanitation District
City of Lafayette (a)
Northwest Lakewood Sanitation District
Pleasant View Water and Sanitation District
South Adams County Water and Sanitation District

METROPOLITAN SEWAGE DISPOSAL DISTRICTS (1)

Metropolitan Denver Sewage Disposal District Number 1

(a) Although cities, the wastewater functions for Brighton and Lafayette are organized under the statutory provisions for sanitation districts.


SCALE
MILES
LEGEND
A - CITY OF ARVADA
B - CITY AND COUNTY OF DENVER
C - CITY OF THORNTON
D - PLEASANT VIEW WATER AND SANITATION DISTRICT
E - SOUTH ADAMS COUNTY WATER AND SANITATION DISTRICT
F - FRUITDALE SANITATION DISTRICT
G - NORTHWEST LAKEWOOD SANITATION DISTRICT
H - CITY OF WESTMINSTER
I - CITY OF ENGLEWOOD
J - CITY OF LITTLETON
K - CITY OF BRIGHTON
L - CITY OF BOULDER
M - CITY OF BROOMFIELD
N - CITY OF LAFAYETTE
O - CITY OF LONGMONT

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WASTEWATER AGENCIES SAMPLED IN STUDY
DENVER SMSA

Wilbur Smith and Associates

FIGURE 2

Regional Council of Governments, the Colorado Municipal League, the Colorado State Association of County Commissioners, the Colorado State Department of Health, and other agencies in an effort to fully coordinate and develop the investigations, research effort, and the preparation of findings. Direct citizen participation was not a necessary element of this study.

During these investigations state statutes and local charter provisions relevant to wastewater management were reviewed, as were municipal and district budgets, audit reports, bond resolutions, and other financial reports. In every case the consultant was awarded easy access to such documents.

Future Action

It is anticipated that this study may have several important uses. First, the results should add to the data inventory of the Denver Regional Council of Governments and establish an enlarged data base to facilitate regional planning and coordinative efforts. Second, it will acquaint the individual agencies with the policies and practices of other agencies. This may assist the individual agencies in reviewing and revising their respective financial and institutional arrangements. Third, the results should assist the Environmental Protection Agency in establishing and reviewing content, guidelines, and monitoring procedures of existing and future grant programs both in the Denver area and in other areas of the United States. Finally, the study may establish a basis for action within the Denver SMSA to clarify and render more effective the wastewater management arrangements.

Section III

THE CONTEXT

This study investigates the financial and institutional aspects of wastewater management in the Denver, Colorado area. It will be read by persons from the Denver area who may not be well acquainted with wastewater functions and agencies, and by persons distant from the Denver area who may not be acquainted with the characteristics of the study area. For these reasons, a brief description of the area, together with a description of the various wastewater agencies is contained herein. This section's material is descriptive, with little analysis, and is meant to acquaint the reader with that which has been studied.

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THE DENVER STANDARD METROPOLITAN STATISTICAL AREA

The study area, which is coterminous with the Denver Standard Metropolitan Statistical Area, consists of 3,661 square miles within five urban counties including and surrounding the City and County of Denver, Colorado, namely, Adams, Arapahoe, Boulder, Jefferson and Denver. The area is a dynamic, rapidly-expanding area with many of the problems and opportunities which confront an area with rapid population and economic growth. Not the least of the problems is the provision of public services such as schools, transportation, recreation, water service, and sewage collection, treatment and disposal.

Population

In 1970 approximately 1,227,529 persons resided in the five county area, which represented 55.6 percent of the total population of the State of Colorado. The study area's population doubled between 1950 and 1970, increasing from 612,128 persons to 1,227,529 persons. This growth accounted for 70 percent of the population growth of the State during this period. Significant to the study is the fact that population growth has occurred largely in the four counties other than Denver.

Estimates made by many different agencies indicate that the Denver SMSA's growth is expected to continue for quite some time. For example, a reasonable estimate of future growth might be that as projected for the Regional Transportation District. That estimate projects the 1990 population to be 1,818,000, which indicates an increase of approximately 30,000 persons annually. Natural increase (births less deaths) accounted for 46.6 percent of the 1960 to 1970 increase, and net in-migration accounted for 53.4 percent. This migration factor is significant as it indicates that the living amenities and employment opportunities exist which likely will support a continued growth rate. Table 2 summarizes the historical and projected demographic changes in the study area between 1950 and 1990. Also shown are the means by which each of the five counties increased in population between 1960 and 1970.

Governmental Entities

Corresponding to this rapid population growth has been an increase in the number of public and quasi-public agencies charged with the provision of public services required by the expanding population. In fact, the area has witnessed

Table 2
DEMOGRAPHIC CHARACTERISTICS
Denver Standard Metropolitan Statistical Area

COUNTY	POPULATION					PERCENT CHANGE	
	1950	1960	1970	1980	1990	1950-1970	1970-1990
Adams	40,234	120,296	185,789	242,000	309,000	361.8	66.3
Arapahoe	52,125	113,426	162,142	236,000	317,000	211.1	95.5
Boulder	48,296	74,254	131,889	172,000	214,000	173.1	62.3
Denver	415,786	493,887	514,678	530,000	548,000	23.8	6.5
Jefferson	55,687	127,520	233,031	325,000	430,000	318.5	84.5
Total	612,128	929,383	1,227,529	1,505,000	1,818,000	100.5	48.1

COUNTY	POPULATION INCREASE: 1960 to 1970				
	Births	Deaths	Natural Increase	Net In-Migration	Total Increase
Adams	36,324	6,645	29,679	35,814	65,493
Arapahoe	27,323	7,455	19,868	28,848	48,716
Boulder	19,903	6,760	13,143	44,492	57,635
Denver	101,644	53,019	48,625	-(27,834)	20,791
Jefferson	37,948	10,179	27,769	77,742	105,511
Total	223,142	84,058	139,084	159,062	298,146

SOURCE: United States Department of Commerce, Bureau of the Census; Regional Transportation District; Colorado Division of Vital Statistics.

a proliferation of such agencies to the point that there are frequent instances of overlapping boundaries and jurisdictions, duplication of efforts, and lack of clarity as to authority and scope.

Table 3 lists the number of such agencies of record in each of the study area's counties. As shown, there are forty-four incorporated municipalities in the metropolitan area, most of which provide and maintain their own sewer systems. In addition, there are 238 special purpose districts (excluding school districts). A majority of these special purpose districts are sanitation, water, or water and sanitation districts. Denver Regional Council of Governments reported, in its 1971 application to Department of Housing and Urban Development for a demonstration program grant, that there were 53 special districts, private associations, mutual corporations and other entities providing water and/or sewer services in the City of Lakewood alone.

Very limited coordination and cooperation between the municipalities and between the special districts has historically occurred. The Denver Regional Council of Governments, whose geographic area coincides with that of the Denver Standard Metropolitan Statistical Area, was formed to provide a catalyst for interagency cooperation and coordination, and to provide a basis for a more regional approach to the problems and opportunities of the metropolitan area.

Economics

One of the reasons that the Denver area is attracting new residents is its strong economy. During periods when much of the country has experienced relatively high unemployment, Colorado and specifically the Denver area have had unemployment rates of well under four percent. The Denver area is a wholesale and retail center for a large geographic area, a transportation center, has much employment in finance and the services, and has a large number of governmental employees. The manufacturing and industry sectors of the economy do not employ as large a percentage of the employed work force as does the United States as a whole, which may account for the area's strength during periods of limited economic expansion.

Development and Land Use

The Denver metropolitan area has expanded in the pattern fashioned by most other urban areas. The area began from

Table 3
UNITS OF LOCAL GOVERNMENT
Denver Standard Metropolitan Statistical Area
1972

	INCORPORATED MUNICIPALITIES (a)				SPECIAL PURPOSE DISTRICTS		TOTAL
	Home Rule Cities	Cities	Towns	Non-Functioning	Special Districts	Special Districts	
Adams	3	2	2	1	36	7	51
Arapahoe	5	1	4	1	72	7	90
Boulder	3	2	5	3	30	2	45
Denver	1	0	0	0	10	1	12
Jefferson	3	2	3	3	90	1	102
Total	15	7	14	8	238	18	300

(a) Cities and towns which cross county lines are included in county which contains the city or town's largest percentage of assessed valuation.

SOURCE: "1972 Local Government Financial Compendium," State of Colorado, Division of Local Government.

a mining/agriculture/transportation base and expanded into services, the military, manufacturing and government. Most early growth occurred in the City of Denver, with a few satellite communities, e.g., Boulder, Fort Collins, Greeley, Golden, Littleton, and Englewood. Almost all development has since occurred bordering these existing urban areas. This trend has occurred primarily because of the employment available in these existing centers, and the availability of public and private services. Many areas have since incorporated, but most of these new cities and towns are actually extensions of the existing, developed areas.

Development patterns are the traditional ones, with a commercial/industrial city center, residential suburbs and, presently, the development of shopping centers and other decentralized facilities outside of the center city. As the area has developed, an extensive system of sewers has evolved which covers most of the developed areas and which is administered by a great many autonomous and semi-autonomous agencies.

Land use densities do not vary as widely as in many other urban areas, because of the lack of densely-populated, high rise residential units. Instead, the residential sectors of the area primarily consist of single family dwelling units. The more dense land uses are primarily the commercial and office buildings in downtown Denver and in a few scattered, commercial/office complexes in and near the suburbs. As such, extension of new sewer service is primarily the extension of service to new developments on previously vacant land. One important exception to this, however, is the City and County of Denver. Denver could expand in two ways: annexation of fringe areas or the development of higher densities. It is probable that the rate and extent of annexation will decrease because of the incorporated areas which nearly surround Denver. Consequently, vertical growth will likely be the major growth type, which will yield different wastewater demands than does horizontal, low density growth in new areas.

Population densities in the five county study area are as follows:

Total study area	- 335.4 persons per sq. mile
Adams County	- 150.2 persons per sq. mile
Arapahoe County	- 203.4 persons per sq. mile
Boulder County	- 176.3 persons per sq. mile
City and County of Denver	- 5417.7 persons per sq. mile
Jefferson County	- 297.6 persons per sq. mile

These densities reflect the almost completely developed nature of Denver City and County, and the fact that there are still great expanses of vacant land in the four remaining counties. In most of the suburban areas the densities appear to be four or five dwelling units per acre. The new developments are quite dense although most consist of single-family, unattached houses. Much multi-unit development has also occurred, although most apartment complexes are not over four to six stories in height.

Some bypassing of vacant lands has occurred. This has had some impact upon the cost of public services, such as sewer collection, interceptor or pumping costs. This may be of increasing concern as development extends into outer reaches of the study area.

As already indicated, population growth and, consequently, land use, is expected to continue much as it has in recent years. The areas adjacent to Denver will undergo substantial residential development, particularly to the south, southeast, southwest, and north. Growth in these areas already is occurring and little is anticipated to hinder development in these directions. This study has sampled wastewater agencies in several of these growth areas, as well as in areas that have not been expanding.

Commercial land uses will follow the movement of residential populations throughout the suburbs, while industrial activities will likely continue near existing industrial areas and in future industrial parks which may be developed.

Table 4 depicts an estimation of changes in land uses between 1970 and 1990 for each of the study area's five counties. As is shown, most residential development will occur in the non-Denver counties, while commercial, office, and industrial uses will be mixed among the five counties.

Table 4
PROJECTED LAND USE CHANGES
Denver Standard Metropolitan Statistical Area

COUNTY	LAND USE INCREASE - ACRES - 1970 to 1990				
	Residential	Commercial	Office	Industrial	Total
Adams	7,470	230	80	270	8,050
Arapahoe	9,540	470	110	270	10,390
Boulder	3,820	190	70	190	4,270
Denver	2,380	290	100	560	3,330
Jefferson	11,470	470	140	440	12,520
Total Study Area	34,680	1,650	500	1,730	38,560

SOURCE: Regional Transportation District.

CURRENT ORGANIZATION FOR WASTEWATER MANAGEMENT

The successful removal of contamination and pollution from the waters of the Denver area requires the proper collection, treatment and disposal of wastewaters which ultimately find their way back to the streams, lakes, and ground water of the area. In portions of the study area sewage is treated by individual septic tanks. However, individual provision of waste treatment and disposal is becoming less prevalent and recent trends in local, state, and federal regulations seem to indicate that public treatment and disposal systems will increasingly replace them; further that growth demands will render uneconomic the development of lots of the sizes required to accommodate individual septic tanks.

For the most part, wastewater is collected, treated, and disposed of by municipal governments and special districts under conditions which permit quality control to be supervised and maintained. This section of the report briefly describes these wastewater agencies, their functions and responsibilities, their internal organizational framework, and their external inter-agency relationships. A more detailed description of agency powers and responsibilities is contained in Section VI.

Wastewater Agency Functions and Statutory Authorities

Each municipality and special district derives its basic formation and operating authorities from the Colorado Revised Statutes. In addition, certain municipalities have been granted "home rule" city charters which confer special powers not contained in the general statutes.

Cities, towns, and counties are authorized, without referendum, to acquire, construct, operate, maintain, improve and extend sewerage facilities, wholly within or wholly without the City (town, county). These entities have broad authority to accept loans and grants, to prescribe and collect rates and charges for services furnished, to issue revenue bonds to finance system acquisition and improvement, and to enter into and perform contractual agreements with other municipalities or agencies for the provision or operation of wastewater facilities.

A second type of wastewater agency is the sanitation or water and sanitation district. This type of agency also derives its powers from the Colorado Statutes. A sanitation district (or water and sanitation district) may be formed wholly within, wholly without, or partially within or without any municipality or county, and may consist of noncontiguous parcels of property.

A sanitation district has much the same powers with respect to sewerage systems as the previously described municipalities and counties. It may acquire, construct, operate and maintain the works and facilities necessary to collect, treat, and dispose of sewage. It can extend sewer lines to areas outside of the district. It can incur indebtedness, acquire real property, fix and collect rates and charges, compel connection with the system if a service line is within 400 feet of a property and, under certain conditions, can levy and collect ad valorem taxes to support operations.

The Colorado State Legislature has also granted the authority whereby metropolitan sewage disposal districts may be formed. Metropolitan sewage disposal districts, e.g., Metropolitan Denver Sewage Disposal District Number 1, may be organized for the purpose of acquiring, by construction or otherwise, improving, and operating a sewage treatment and disposal system or systems to intercept, receive, transport, treat and dispose of the outfalls of sewer systems of other agencies. Metropolitan districts are expressly forbidden from collecting sewage, having been created for the specific purpose of treating and disposing of wastes collected by member agencies.

The metropolitan sewage disposal district, in performing a regional wastewater function, has powers and duties pertaining to a public body politic and corporate, constituting a quasi-municipal district.

Like the municipalities and districts, the legislation concerning metropolitan sewage disposal districts is quite comprehensive.

No attempt has been made in this study to cite all of the legislative powers and duties given to any of the various wastewater agencies. Rather, the basic enabling legislation has been examined to ascertain its general content and sufficiency. During the course of the interviews held, no agency expressed the desire for any form of new or expanded grant of legislative authority, although several representatives expressed the belief that changes in organizational form were inevitable, if not totally desirable, to meet changing needs. There appeared to exist, in several agencies, a lack of information concerning opportunities for change or improvement in external or internal organization and management.

Wastewater Agencies' Organizational Framework

The various agencies concerned with wastewater management in the Denver area are given some latitude in their organizational structures. Despite this, there is substantial uniformity between the different municipalities and between the various districts. Municipalities are general purpose governments with a variety of functions. The municipal wastewater function is thus usually performed by a department of the city, sometimes also responsible for water treatment and distribution. Varying arrangements exist with respect to engineering functions, and the relationship of the department to the engineering or finance departments. The director of the wastewater department normally reports directly to the city manager, who is the administrative head of all departments and agencies, and can thus organize and coordinate the respective functions in accordance with the city charter, or as may be approved by the City Council.

The municipal departmental or internal organization, inter-relationships and degree of self-containment differ considerably, with the principal cause being the differing size and complexity of the governmental unit, and consequently differing professional and technical staff needs.

The special sanitation districts are autonomous, single-purpose entities, with no other functions. The wastewater function is the reason for which the agency exists, and there are consequently no other departments, although certain internal divisions may exist in the larger districts. Each district is governed by an elected board of directors. In addition, there is a staff of the size and composition deemed necessary to administer the operations of the district. Few districts have more than several employees as staff personnel, primarily because of the small size of most of the districts. Highly technical work, engineering design, construction supervision and other non-recurring work is usually performed by consulting engineering firms. Every sampled district had a private engineer on retainer to perform these types of functions. Several of the smallest districts had only one part-time person for billing and collecting and one part-time person who functioned in a repair/maintenance capacity, with all other personnel on a retainer basis, e.g., accountant, attorney, and engineer.

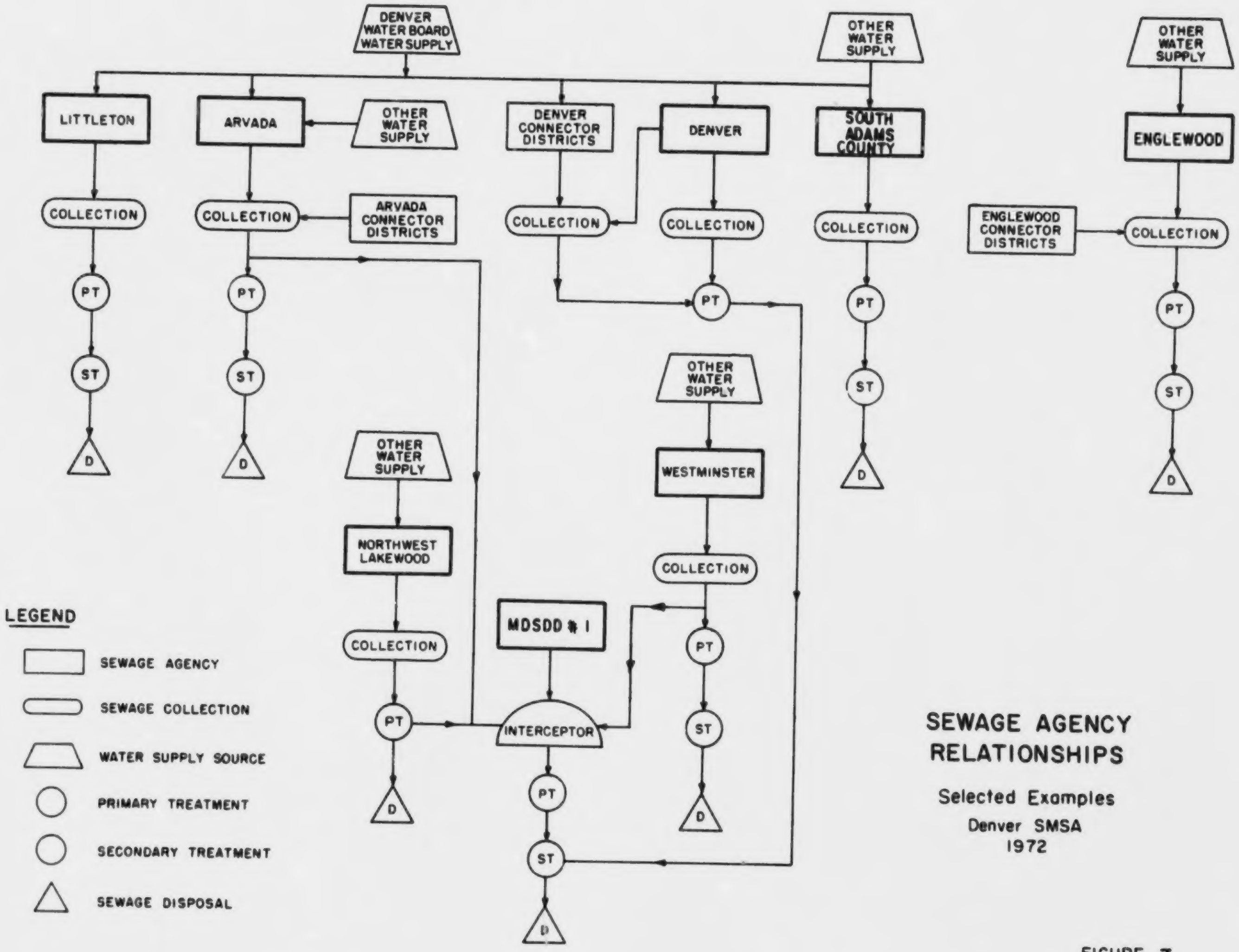
The organizational structure of Metropolitan Denver Sewage Disposal District Number 1 (MDSDD #1) is far more sophisticated, primarily as a result of its large staff requirements. In order to perform its prescribed functions, MDSDD #1 in 1972 employed 120 persons. The district is organized into four departments, all of which report directly to the MDSDD #1 manager. The departments are administrative services, engineering, operations and maintenance, and laboratory services. Operations, in terms of personnel, is far larger than the other departments.

The Colorado Revised Statutes require that any metropolitan sewage disposal district be governed by a board of directors. Each member agency and municipality is represented on that board, with one board member representing every twenty-five thousand persons, or fraction thereof, in his or her district or municipality. No one member is entitled to more than one-half of the total board membership, and each board member is appointed by the governing body or executive of each member agency. Because each member agency has a member of the board, but no member agency can have more than half of the members, each board member represents a different number of people. For example, the Pleasant View board member represents all 4,800 persons of that district; the Northwest Lakewood member, 15,600 persons; and each Denver member represents 24,000 persons, assuming the same present board membership. At present, the board of directors is composed of approximately fifty members. In order to allow such a large group to function, a committee structure has been established, which includes an executive committee.

Wastewater Agency Interrelationships

As indicated, the agencies dealing with wastewater in the Denver area are quite autonomous. This is not to say, however, that there is no interaction between agencies. To the contrary, many of the agencies functionally interact by means of water supply source, use of other agency's collection or treatment facilities, and so on. The total extent of interaction is so complex that to fully describe it would require a lengthy, confusing document. It is possible, however, to depict the range of formal relationships by use of several examples.

Figure 3 depicts these relationships for eight of the sixteen sampled agencies. These agencies were selected because they represent most of the types of interaction between wastewater agencies within the study area. By following the arrows on the figure, it is possible to follow the water and wastewater flows for each agency and


DENVER WATER BOARD WATER SUPPLY
OTHER WATER SUPPLY
OTHER WATER SUPPLY
LITTLETON
ARVADA
OTHER WATER SUPPLY
DENVER CONNECTOR DISTRICTS
DENVER
SOUTH ADAMS COUNTY
ENGLEWOOD
COLLECTION
ARVADA CONNECTOR DISTRICTS
ENGLEWOOD CONNECTOR DISTRICTS
PT
ST
D
OTHER WATER SUPPLY
WESTMINSTER
OTHER WATER SUPPLY
NORTHWEST LAKEWOOD
MDSDD # 1
INTERCEPTOR
LEGEND
SEWAGE AGENCY
SEWAGE COLLECTION
WATER SUPPLY SOURCE
PRIMARY TREATMENT
SECONDARY TREATMENT
SEWAGE DISPOSAL

SEWAGE AGENCY RELATIONSHIPS

Selected Examples
Denver SMSA
1972

FIGURE 3

between the agencies. Also depicted on the figure are the wastewater processes performed by each agency, and those functions performed for one agency by another.

The City of Englewood, as depicted on Figure 3, has no formal relationship with any of the other agencies. It obtains nearly all of its water supply from its own wells, collects its own sewage, and operates its own primary and secondary treatment plants.

The other seven agencies depicted on Figure 3 have some type of formal working arrangement with at least one of the other agencies shown on the figure. Littleton, like Englewood, collects, treats and disposes of its own sewage. However, Littleton receives its water by way of the Denver Water Board, and has a direct relationship with that agency. The City of Arvada also obtains some of its water supply from the Denver Water Board, and collects its own sewage. It also has its own primary and secondary treatment plant. However, Arvada is a member of Metropolitan Denver Sewage Disposal District Number 1 and transmits part of its sewage to the MDSDD #1 for treatment. As such, Arvada has a direct relationship with these two agencies. In addition, Arvada has outside connector districts which collect sewage and discharge it through the Arvada system.

Northwest Lakewood is not served by the Denver Water Board but, because it does not have its own secondary treatment facilities, is a member of MDSDD #1 and transmits sewage requiring secondary treatment on to MDSDD #1. The City of Westminster has treatment facilities but is also a member of MDSDD #1 and transmits part of its sewage to that agency for disposal. The City and County of Denver receives its water from the Denver Water Board and is otherwise conncected to a great many other agencies. For example, Denver operates primary treatment facilities but then transmits the sewage to MDSDD #1 for secondary treatment. In addition, a number of municipalities and districts collect sewage which is transmitted through the Denver system and, ultimately, to MDSDD #1, for treatment, even though the originating agencies are not members of MDSDD #1.

Thus, Figure 3 is a very simplified example of the types of arrangements by which the Denver area wastewater agencies operate. It shows that there are many different arrangements available to each of the agencies and there is consequently considerable flexibility in selecting the means by which particular needs of each wastewater agency may be met.

Note should be taken that the Denver Water Board, a large regional supplier, has no direct wastewater responsibilities, although its plans and operations have tremendous implications for the wastewater agencies and their operations.

Characteristics of the Sampled Agencies

As indicated, this study investigated the financial affairs of the wastewater agencies in the Denver area by sampling sixteen representative agencies. Included were municipalities of differing sizes and characteristics, special sanitation districts of varying sizes and characteristics, and a large metropolitan sewage disposal district.

There are well over one-hundred municipalities and special districts providing some form or degree of wastewater service within the Denver Metropolitan Statistical Area. In addition, there are perhaps that many special contractual users or agencies which supply their own service, e.g., military, large industries, and so on. The jurisdictional and service area boundaries appear frequently to be haphazardly drawn, overlapping the boundaries of districts formed for other special purposes, and to occasionally represent either a development decision or the failure of a municipality to extend services beyond its boundaries.

The service area, population served, and number of connections (taps) of each of the sixteen agencies are depicted on Table 5. As shown, the agencies vary in size, from 600 acres (Lafayette) to 90,048 acres (Denver); from 3000 persons (Fruitdale) to 601,300 persons (Denver); and from 576 connections (Fruitdale) to 161,200 connections (Denver). Metropolitan Denver Sewage Disposal District No. 1 in 1972 served an area of approximately 267 square miles. As is shown on this table, several of the sampled agencies and many of the non-sampled agencies are quite small in both number of connections and geographically.

The services provided and the methods of providing these services also vary among the different agencies. All of the sampled agencies (excluding MDSDD #1) perform sewage collection. These collection agencies provide laterals to which are connected the service lines of residential and other users, sub-mains which collect sewage from the many laterals, and mains or trunk lines which carry sewage from large areas of laterals and sub-mains.

All of the wastewater thus collected by the collection agencies must be treated so that the effluent will meet federal, state and local clean water standards. A range

Table 5
WASTEWATER SERVICE AREAS
Selected Municipalities and Sanitation Districts
Denver SMSA

JURISDICTION	SERVICE AREA 1970 Acres	POPULATION SERVED		POP. PER SQ. MILE 1970	SEWER CONNECTIONS	
		1970	1972		1970	1972
Municipalities						
Arvada	23,040	46,814	58,700	1,300	10,550	14,183
Boulder	10,000	68,000	71,000	4,359	14,200	15,927
Broomfield	1,000	7,261	8,400	4,841	1,900	2,200
Denver	90,048	586,857	601,300	4,171	121,083	161,200
Englewood	32,000	65,000	74,000	1,300	18,628	21,161
Littleton	6,400	39,500	N.A.	3,950	6,723	8,000
Longmont	2,630	23,000	26,000	5,610	6,000	8,000
Thornton	12,800	57,022	68,300	2,851	12,500	18,664
Westminster	3,230	21,540	22,100	4,265	5,500	5,629
Districts						
MDSDD #1	140,000	879,552	944,400	4,016	199,000(a)	246,501
Brighton	2,080	8,700	9,500	2,636	2,000	2,634
Fruitdale	1,200	2,760	3,000	1,476	469	576
Lafayette	600	4,200	5,500	4,667	950	1,250
N.W. Lakewood	1,400	13,825	15,600	6,313	3,512	3,969
Pleasant View	1,220	4,386	4,800	2,308	700	857
South Adams	5,000	20,000	25,000	2,564	5,290	5,740

(a) Metropolitan Denver Sewage Disposal District No. 1 does not collect sewage itself. Rather, it treats the sewage collected by districts and municipalities which have approximately 246,500 taps.

SOURCE: Contacts with district and municipal officials; "Areawide Sewerage Master Plan Report - Phase I, Inventory" by Denver Regional Council of Governments, February, 1970; Metropolitan Denver Sewage Disposal District No. 1; Wilbur Smith and Associates.

of facilities and provisions exists for such treatment, as shown on Table 6. Several of the collection agencies do not maintain treatment facilities. When this is the case, the sewage is transmitted for treatment to another agency, usually the Metropolitan Denver Sewage Disposal District Number 1, on a contractual basis. In addition, several of the agencies which maintain treatment plants also are members of MDSDD #1, either because the collection agency's treatment plant is of inadequate capacity, or because it is only suitable for primary treatment.

Primary treatment,as defined herein, relates to the various processes by which solids are settled and removed from the liquid sewage. This is usually accomplished by means of screening, a grit chamber, or sedimentation tanks. As shown on Table 6, many of the agencies provide their own primary sewage treatment facilities. Those which do not, transmit sewage to an agency which can provide treatment.

Following primary treatment, the sewage enters the secondary treatment phase. In secondary treatment, the organic matter in sewage is removed, usually by making use of the bacteria itself. The principal means of secondary treatment, both of which are in evidence in the sampled agencies, are trickling filters and the activated sludge process. Filters appear to be predominant in the smaller agencies, while the largest secondary treatment facility (MDSDD #1) utilizes the activated sludge process.

A third treatment stage may be provided, known as advanced waste ("tertiary") treatment. This is the final treatment process, which removes additional pollutants to meet water pollution standards. On the basis of data generated in this study, it appears that no agency is currently providing advanced waste treatment.

By reviewing each agency's facilities, it is seen that the small wastewater agencies have generally found it to be uneconomical to maintain their own sewage treatment plants. Consequently, the waste must be transmitted elsewhere for treatment. In addition, the trend indicates a growing differentiation of functions between collection and treatment, with agencies specializing in each of these. MDSDD #1 has specialized in treatment and disposal (the Metro District cannot legally serve as a sewage collection agency) while many of the smaller agencies provide only collection. Agencies with treatment facilities may accept sewage from other collection agencies and provide treatment on a contractual basis. Denver, Littleton, and Englewood each serve these functions.

Table 6
WASTEWATER FACILITIES
Selected Municipalities and Sanitation Districts
Denver SMSA
1970

JURISDICTION	SEWERAGE TREATMENT PLANTS				LIFT STATIONS	
Municipalities	Number	Type	Capacity (MGD)	Operation	Number	Pumps
Arvada	1	Trickling Filter	0.7	Own & Metro	0	0
Boulder	2	Primary	14.4	Own	1	2
Broomfield	1	Primary and Sec.Filters	1.6	Own	1	2
Denver	1	Primary	125.0	Own & Metro	1	2
Englewood	2	Sec.Filters	8.0	Own	0	0
Littleton	1	Primary and Sec.Filters	7.6	Own	4	7
Longmont	1	Primary and Sec.Filters	5.6	Own	2	4
Thornton	0	-	-	Metro	3	9
Westminster	1	Primary and Sec.Filters	0.6	Own & Metro	2	4
Districts						
MDSDD #1	1	Activated Sludge	98.0	Metro	1	3
Brighton	1	Primary and Sec.Filters	1.0	Own	1	2
Fruitdale	0	-	-	Metro	0	0
Lafayette	1	Primary and Sec.Filters	N.A.	Own	0	0
N.W. Lakewood	1	Primary	1.8	Own & Metro	0	0
Pleasant View	0	-	-	Metro	1	2
South Adams	1	Primary and Sec.Filters	2.5	Own	6	14

SOURCE: "Areawide Sewerage Master Plan Report, Phase I, Inventory," Denver Regional Council of Governments, February, 1970.

Metropolitan Denver Sewage Disposal District No. 1

On May 15, 1961, the Metropolitan Denver Sewage Disposal District Number 1 was formed by thirteen charter members (municipalities and special districts) as authorized by Chapter 89, Article 15, Colorado Revised Statutes. The purpose of MDSDD #1 is to receive, treat, and dispose of all sewage, without limitation as to flow, which may be delivered to the system from member districts and municipalities. The district, then, treats and disposes of the sewage of various agencies which choose not to maintain their own treatment facilities, or do not have adequate treatment capacity.

Table 7 lists all members of MDSDD #1 in 1972, and their dates of membership. Any municipality or special district can be included in MDSDD #1 if the Metropolitan District finds that inclusion of the applying agency is economically feasible and if the Board of Directors so approves. Nine agencies have joined the district since its inception. It would appear that there is a trend toward membership in or utilization of such regional facilities and services. Although the vast majority of municipalities and special sanitation districts are not yet members, many non-members actually receive treatment of their wastes by MDSDD #1 through physical connection and contractual arrangements with member agency systems.

While MDSDD #1 directly serves only a few of the many wastewater agencies in the Metropolitan Area, it serves the majority of residences in the area through its member collection agencies. For example, the population of the five county Denver Standard Metropolitan Area in 1970 was approximately 1.2 million persons. In the same year, MDSDD #1 treated the sewage of member agencies which serve approximately 870,000 persons. Thus, while MDSDD #1 serves but a small percentage of the total municipalities and districts, it serves as much as 72.5 percent of the area's population. This, of course, is largely due to the membership of Denver (1970 population of 521,000 persons) in the district, and to those agencies who deliver wastes to Denver which are subsequently transmitted to MDSDD #1.

MDSDD #1 also serves the major portion of the developed area including and immediately adjacent to the City and County of Denver. The only major developed areas not served by MDSDD #1 are located to the south of Denver, e.g., the Englewood, Littleton, Cherry Hills and Greenwood Village areas, and the areas north-west of Denver, e.g., the Boulder, Lafayette, Broomfield area. In addition,

Table 7
MEMBERSHIP IN METROPOLITAN DENVER SEWAGE DISPOSAL DISTRICT NO. 1
Year Membership Attained

MEMBER	YEAR MEMBERSHIP STARTED								
	1964[a]	1965	1966[b]	1967	1968	1969	1970	1971	1972
Alameda Water and Sanitation District	X								
Applewood Sanitation District				X					
City of Arvada	X								
City of Aurora			X						
Bancroft Water and Sanitation District	X								
Berkeley Water and Sanitation District	X								
Crestview Water and Sanitation District	X								
City and County of Denver	X								
East Lakewood Sanitation District	X								
Fruitdale Sanitation District				X(c)(d)					X
City of Golden									X
Highland Park Sanitation District	X								
North Pecos Water and Sanitation District			X						
North Table Mountain Water and Sanitation District	X								
North Washington Street Water and Sanitation District	X								
Northwest Lakewood Sanitation District	X								
Packaging Corporation of America (Special Connector)									
Pleasant View Water and Sanitation District				X(d)					
City of Thornton			X(d)						
City of Westminster	X								
Westridge Sanitation District			X						
Wheat Ridge Sanitation District	X								

(a) Original members of the district.
(b) While the district was formed prior to 1966, the treatment plant did not become operational until 1966.
(c) Fruitdale received approval to discharge sewage to the Metro plant, but did not receive approval for membership until 1972.
(d) All wastes transmitted without prior treatment.

SOURCE: Metropolitan Denver Sewage Disposal District No. 1

Rocky Mountain Arsenal and the City of Brighton are also excluded. Several small districts and municipalities, which are not yet members, are surrounded by areas that are served by MDSDD #1.

Because MDSDD #1 treats but does not collect sewage, it is a special case which cannot be directly compared with the operations or statistics of the other sampled agencies. Nevertheless, it is a very important wastewater agency in the area which poses significant implications for all of the wastewater agencies with respect to physical provisions and financial arrangements.

Section IV

CURRENT WASTEWATER FINANCIAL PRACTICES

Wastewater agency policies, plans, physical facilities, and ability to meet standards are dependent on the agency's willingness or duty to perform wastewater functions, and its ability and capacity to do so. The ability to perform is in turn dependent on two variables: extent of legal powers and financial capability. This chapter deals with the latter variable, that is, the financial constraints and capabilities for wastewater management.

Public bodies and private citizens desire abundant clean water, effective pollution abatement, and other goals, standards and objectives which are beneficial from sanitation, environmental, and economic viewpoints. In order to achieve these purposes, legislation has been enacted, regulations have been promulgated, loans and grants have been issued, standards have been established, and considerable technical investigations and construction programs have been undertaken. These measures have been, for the most part, beneficial in achieving many of the goals and objectives of recent years.

However, the further attainment of these goals and objectives will continue to be dependent on the monetary resources available with which to implement them. Monies for implementation come from a variety of sources. The users of service, the beneficiaries of service, various levels of governmental, and other revenue sources have all contributed. These sources of revenue, the constraints upon revenue production, the type and magnitude of requirements and the current use of available funds are the wastewater factors with which this chapter deals. It is hoped that a detailed understanding of these aspects of wastewater management will lend insights into the financial needs and resources of the wastewater agencies and, consequently, knowledge as to what goals and objectives are feasible and what methods are best suited to wastewater agency financial requirements. If meaningful financial planning can be accomplished, it is likely that a principal obstacle to achieving the goals of effective and efficient wastewater management will be lessened and, in some instances, removed.

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SOURCES OF WASTEWATER REVENUE

Within the Denver Standard Metropolitan Statistical Area, those agencies charged with the collection and/or treatment and disposal of wastewater utilize a wide range of revenue sources to finance their operations, maintenance, and capital improvements. The sixteen sampled municipalities and districts utilize a total of eleven different significant sources of revenue. The trend appears to be toward the expansion of revenue sources and the application of higher revenue rates for each source.

Table 8 lists many of the revenue sources presently available to the various wastewater jurisdictions. All sixteen sampled jurisdictions use some type of service charge. Fourteen use a connection (tap) charge (MDSDD #1 has no connections to individual users and as such has no tap charge, while the City and County of Denver has no tap charge as such but does charge the owner the cost of the connection). All sixteen jurisdictions presently have, or recently had, outstanding debt. Twelve of the sixteen jurisdictions have revenue bonds outstanding, while five have outstanding general obligation bonds. No municipality uses a property tax levy to directly support its wastewater operations, while four special sanitation districts utilize a tax levy to help support their sewerage systems. Special improvements to the sewerage system are funded through the creation of special improvement (benefit assessment) districts in six of the sampled jurisdictions (the number may actually be more than six because several of the officials may not have understood exactly what constituted a special improvement district). Federal funds have been used by half of the sampled jurisdictions, and most of the agencies have applied for federal funds for upcoming projects. No agency has been granted direct state or county financial assistance because such funds are not now available to them. In addition, no wastewater agency receives a direct appropriation of general fund monies (in fact they often contribute to the general fund) nor have they received any portion of the municipalities' annexation fees. Seven of the jurisdictions have plant investment fees, although these charges often have a different name. In addition, six agencies reported that they levy special assessments, five reported a connection permit fee (usually included in the tap fee) and two districts reported the use of an inclusion fee. No wastewater agency anticipated receiving general revenue sharing monies, although the final use of such monies had not yet been determined by most of the municipalities at the time of this study.

Table 8
WASTEWATER REVENUE SOURCES
Used and Not Used
Selected Municipalities and Sanitation Districts
Denver SMSA
1967 - 1972

	Service Charge	Connection (Tap) Fee	Revenue Bonds	General Obligation Bonds	Mill Levy (Property Tax)	Special Improvement Distr.	Federal Funds	State Funds	County Funds	Plant Investment Fees(c)	General Fund Monies	Annexation Fee	Special Assessments	Inclusion Fee	Permit Fee (Tap Inspection)	General Revenue Sharing
JURISDICTION	REVENUE SOURCES															
Municipalities																
Arvada	X	X	X			X	X			X			X		X	
Boulder	X	X	X			X	X			X					X	
Broomfield	X	X	X				X			X						
Denver	X			X		X										
Englewood	X	X	X				X			X					X	
Littleton	X	X	X			X							X			
Longmont	X	X	X	X			X									
Thornton	X	X	X							X(b)						
Westminster	X	X	X				X						X			
Districts																
MDSDD #1	X		X				X									
Brighton	X	X	X			X	X			X			X			
Fruitdale	X	X	X		X											
Lafayette	X	X	X										X			
N.W. Lakewood	X(a)	X		X	X									X		
Pleasant View	X	X		X	X										X	
South Adams	X	X		X	X	X				X			X	X	X	

(a) Commercial users only.
(b) Only where the city has front-ended an extension.
(c) Buy-in fee, often not labeled Plant Investment Fee.

An "X" indicates that source of revenue is being used.
A blank indicates that source of revenue is not being used.

While most wastewater agencies use service charges and tap fees, plus a scattering of other revenue sources, there is a great variance between the charges imposed and the revenues accruing from these various sources. Table 9 depicts the total revenues accruing to each wastewater agency in 1970, and depicts the major sources of such revenues. No comparisons have been made of revenue per capita or per tap; such comparisons could be misleading as industrial and commercial revenue sources and cost factors would be included which would distort the data.

As shown, the service charge produces the greatest revenues to the agencies, varying between 95.4 percent of all City and County of Denver wastewater revenues and 6.6 percent of all Northwest Lakewood wastewater revenues. These two jurisdictions are unique, however, because Denver has no tap charge nor mill levy, while Northwest Lakewood levies a sewer service charge for commercial use only. MDSDD #1 receives all of its operating revenues from users through the service charge. The average service charge, excluding MDSDD #1 and the City and County of Denver, constitutes 62.6 percent of the remaining fourteen agencies' revenues in 1970.

The next major generator of revenue is the connection (tap) charge. Included in this revenue class on Table 9 is the tap charge, plus any plant investment fee and permit fee as reported. The connection charge, as a percent of total revenues, varies between a high of 39.4 percent (Westminster) and a low of 2.7 percent (South Adams County), again excluding MDSDD #1 and the City and County of Denver. By excluding these two agencies, it is found that the connection (tap) charge constituted an average of 22.9 percent of the remaining fourteen agencies' revenues in 1970.

Interest income, as reported on Table 9, is that revenue generated by investment of temporarily idle funds that were previously derived from other revenue sources. The interest is generally earned from monies invested in short-term federal securities and bank or savings and loan certificates of deposit.

As indicated, four of the districts use a tax levy as a source of current revenue. The mill levy, as a percent of each of the four agencies' total revenues, ranges between 54.4 percent (Northwest Lakewood), and 30.5 percent (Pleasant View). Of the four agencies utilizing this revenue source, the tax revenue constitutes an average of 48.1 percent of total revenues.

Table 9
WASTEWATER REVENUES
Selected Municipalities and Sanitation Districts
Denver SMSA
1970

JURISDICTION	SERVICE CHARGES		TAP FEES		INTEREST		MILL LEVY		OTHER		TOTAL
Municipalities	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount
Arvada	$368,753	68.1%	$126,230	23.3%	$46,354	8.6%	None	0.0%	$ 0	0.0%	$541,345
Boulder	771,533	58.4	442,811	33.5	103,629	7.9	None	0.0	2,454	0.2	1,320,427
Broomfield	60,000	87.4	8,000	11.7	625	0.9	None	0.0	0	0.0	66,625
Denver	5,547,886	95.4	0	0.0	29,000	0.5	None	0.0	236,000	4.1	5,812,886
Englewood	275,825	66.3	64,002	15.4	75,239	18.1	None	0.0	652	0.2	415,718
Littleton	155,661	74.6	52,720	25.3	0	0.0	None	0.0	155	0.1	208,536
Longmont	183,819	61.4	88,585	29.6	23,732	7.9	None	0.0	3,159	1.1	299,295
Thornton	644,809	88.8	62,663	8.6	18,604	2.6	None	0.0	0	0.0	726,076
Westminster(1971)[a]	168,161	55.0	120,693	39.4	17,085	5.6	None	0.0	0	0.0	305,939
Districts											
MDSDD #1	4,978,765	95.7	0	0.0	192,716	3.8	0	0.0	27,277	0.5	5,198,758
Brighton (1971)	90,182	77.0	24,146	20.6	1,650	1.4	None	0.0	1,130	1.0	117,108
Fruitdale (1973)	25,000	30.6	12,000	14.7	0	0.0	$40,000	49.0	4,700	5.7	81,700
Lafayette	45,169	90.9	4,500	9.1	0	0.0	None	0.0	0	0.0	49,669
N.W. Lakewood (1971)	17,214[c]	6.6	72,734	27.7	13,027	5.0	142,759	54.4	16,390	6.3	262,124
Pleasant View [a]	44,993	56.0	8,000	10.0	1,250	1.5	24,493	30.5	1,650	2.0	80,386
South Adams	140,000	46.7	8,000	2.7	9,000	3.0	140,750	47.0	2,000	0.6	299,750

(a) Sewerage and water records are combined. Figures shown here are approximations of actual wastewater revenues.

(b) Service charge on commercial users only. Residential users do not have a service charge but rather pay via the mill levy. This figure includes revenue from a $10,000 service agreement with College Park.

Note: Several of these figures represent budgeted estimates rather than actual revenues.

SOURCE: Contacts with district and municipal officials; official records.

The sewer service charge, connection (tap) fee, and tax levy constitute 92.8 percent of the revenues of the agencies (excluding MDSDD #1 and the City and County of Denver). Even though the agencies utilize many different sources of revenue, it appears that these three are the only significant operating revenue sources used by the sixteen sampled agencies. In addition, of course, is the issuance of long-term debt for capital improvements by all of the agencies. Each of these major revenue sources is described in detail as follows.

Sewer Service Charges

All of the sixteen sampled municipalities and districts charge a fee for supplying sewer service to the individual residential, commercial, industrial and public users connected to the sewerage system. In most cases the sewer service charge is a major source of revenue, as already depicted on Table 9. The service charge yields approximately 67.6 percent of all revenues accruing to the municipal wastewater agencies (excluding MDSDD #1 and the City and County of Denver), and 37.3 percent of that accruing to the districts. While the service charge as a revenue producer varies widely among the districts, it is more standard with the municipalities, usually ranging between 60 and 80 percent of total municipal wastewater revenues.

The sewer service charge, while not a new concept, has come under increasing use as municipal and district wastewater agencies have had to search for ever-expanding sources of revenues. In a 1963 study by the Colorado Municipal League, Municipal Sewer Service in Colorado, as many as 78 percent of the municipalities in Colorado reported using a sewer service charge. That number has undoubtedly increased in the intervening years.

There are a variety of means for deriving a sewer service charge including flat rates per unit, a percent of the water bill, or rates based on the number of employees or inhabitants, the number of rooms, the number of fixtures, metered water consumption, the size of the meter, the number of sewer connections, or contribution of sewage to the system by volume and/or composition. The type and rate of user charge will often differ according to the type of user, e.g., residential, commercial, industrial, or public and institutional.

Table 10 indicates that only several of these methods of computing the service charge are in use on the part of the sampled districts and municipalities. Of the nine municipal-

Table 10
SEWER SERVICE CHARGES
Selected Municipalities and Sanitation Districts
Denver SMSA
1972

JURISDICTION	BASIS OF SERVICE CHARGE			TYPICAL MONTHLY SERVICE CHARGE Residential (a)	
Municipalities	Residential	Commercial	Industrial	Inside City or District	Outside City
Arvada	Per Unit	Meter Size	Meter Size and Type of Discharge	$2.23	$4.03
Boulder	Per Unit plus per Water Use	Meter Size plus Per Water Use	Meter Size plus per Water Use	2.75	4.12
Broomfield	Per Unit	Per Unit plus Percent of Water Bill	Per Unit plus Percent of Water Bill	3.50	3.50
Denver	Percent of Water Bill (b)	Percent of Water Bill (b)	Percent of Water Bill (b)	3.25	3.08
Englewood	Per Unit	Number of Fixtures	Percent of Water Bill	1.25	1.75
Littleton	Percent of Water Bill	Meter Size	Meter Size		2.40
Longmont	Percent of Water Bill	Percent of Water Bill	Percent of Water Bill	2.50	
Thornton	Per Unit	Percent of Water Bill	Negotiable Contract	3.50	3.50
Westminster	Per Unit	Per Water Use	Negotiable Contract	3.00	3.50
Districts					
Brighton	Per Unit	Percent of Water Bill	Contract	3.00	
Fruitdale	Per Unit	Per Unit	Fixture Units;(c) or Percent of Water Bill, or Negotiated	2.00	
Lafayette	Per Unit	Per Unit or Percent of Water Bill	Negotiable Contract	3.00	
N.W. Lakewood	Per Unit	Fixture Examination (d)	Fixture Examination (d)	1.50	
Pleasant View	Per Unit	Fixture Examination (d)	Fixture Examination (d)	2.00	
South Adams	Per Unit	Percent of Metered Water Consumption	Percent of Metered Water Consumption	2.00	

(a) Assumes 7,000 gallons of water per month in winter, 10,000 gallons per month average annually.
(b) Percent of water bill if inside city; per gallon or per unit if outside of city.
(c) Unit has 19 fixture units.
(d) Examination of quantity and type of contribution to sewer.
SOURCE: Contacts with district and municipal officials.

ities, five use a flat charge per residential dwelling unit which averages $2.70 per month. The other four municipalities charge a percent of the water bill or a flat charge plus a percent of the water bill. Regardless of the method used, the applicable rates are quite similar on the average. However, on an individual agency basis, the typical municipal service charge for residential units varies between a low of $1.25 per month (Englewood) and a high of $3.50 per month (Broomfield and Thornton).

All six districts sampled (excluding MDSDD #1) charge a flat rate per unit for residential use. This rate averages $2.25 per month, which is less than the municipal average rate.

When there is sewer service to areas outside of the city limits, most municipalities charge a slightly higher than inside-city rate to outside-city users. For example, residential service charges average $3.22 per month outside of the municipality compared to $2.76 per month inside. Not all municipalities provide this type of rate differential. This differential is usually justified on the basis of the higher costs to serve outlying areas, or that city residents are ultimately responsible for retiring bonded debt or have had heavier prior investment in the system, or sometimes as purely an incentive to annexation. The courts have generally held that outside users constitute separate classes of users and that such differentials are lawfully established.

The service rate charged commercial and industrial users is usually more complex than that charged residential users, with an attempt to charge the commercial and industrial users more in line with the demand each user places upon the sewer system. For example, only one agency charges a flat fee for commercial use and no agency charges a flat fee for industrial use. Three agencies charge commercial users on the basis of meter size, six charge as a percent of the water bill, and three charge according to the number of fixtures in the commercial establishment.

For industrial users, the rate is based on the water bill or volume of water use, an examination of the number and type of fixtures, the size of the meter, and the type of sewage discharged. There is also a trend toward special negotiated contracts for industrial users. The use of special, negotiated contracts is coming under increased use because the agencies desire to charge a service fee that is adaptable to the cost of supplying the service and treating the waste discharged by the industry. This cost of service varies greatly because of the large variations in flow and loadings of wastes discharged by the different industries. Investigation of the extent to which industrial users are individually bearing the cost of treating wastes of particular volumes and composition was beyond the scope of study.

Tables 11 and 12 depict four service charge schedules which are typical but yet illustrate the different approaches taken in defining service charge rates. As shown, the City of Thornton charges a flat fee per residential unit and charges the same rate regardless of whether or not the user is within the city limits. On the other hand, the City of Boulder charges a minimum flat charge plus a fee per unit of water use for residential users, and charges a fee based upon water use plus a flat fee based upon meter size for commercial and industrial users. In addition, Boulder charges customers located outside of the City limits at a rate one and one-half times that charged customers within the City boundaries. South Adams County, on the other hand, charges its commercial and industrial users a percent of their water bills, with a minimum bill stipulation. It does not supply services outside of its district boundaries.

Each of the three service charge rate schedules on Table 11 are relatively simple. Some agencies attempt to levy flat rate service charges which are scaled to reflect type and volume of anticipated use. An example of this is the City of Englewood, whose rate schedule is depicted on Table 12. Englewood levies a different annual service charge for each of many different types of users in accordance with their varying use characteristics. In this way the City attempts to place equitable rates according to the load placed upon the system.

In addition to the above-described sewer service charges, Metropolitan Denver Sewage Disposal District No. 1 derives its revenue from a service charge upon its members. This charge will be described in the section of this report dealing with contractual payments and is dealt with as a cost to member agencies rather than as a revenue source. However, its form and application are suited to any agencies having other than residential users.

The sewer service charge is an important source of municipal and district revenue, and one which offers numerous advantages.

Table 11
TYPICAL SEWER SERVICE CHARGE SCHEDULES
Thornton, Boulder, and South Adams County
Denver SMSA
1972

JURISDICTION	MONTHLY SEWER SERVICE CHARGE	
	Inside City Limits	Outside City Limits
City of Thornton		
Residential - Single Family (a)	$3.50/mo.	All service charges to areas outside of the City are the same as the rate charged inside the City.
Residential - Multi-family(per unit)(b)	$3.50/mo.	
Mobile Home	$3.50/mo.	
Commercial	$3.50/mo. or 55% of water bill(c)	
Industrial	Negotiated Contract.	
City of Boulder		
Residential	$1.50/mo. plus $.18/1000 gallons average winter consumption(d)	All service charges to areas outside of the City are 1½ times the rate charged inside the City.
Commercial	$.34/1000 gallons average winter consumption(d) plus charge based on meter size: Meter Size Charge 3/4" 1.50 1" 2.55 1¼" 3.75 1½" 4.95 2" 7.95 3" 15.00 4" 25.05 6" 49.95 8" 79.95	
South Adams County Water and Sanitation District		
Residential - per unit	$2.00	No service to areas outside of the District.
Mobile Home	$1.00	
Commercial	25% of monthly water bill ($2.50 minimum)	
Industrial	25% of monthly water bill ($2.50 minimum).	

(a) Includes churches.
(b) Occupied units only.
(c) Whichever is greater.
(d) Average Winter consumption - January, February, and March.

Table 12

TYPICAL SEWER SERVICE CHARGE SCHEDULE

Englewood
Denver SMSA
1972

JURISDICTION	ANNUAL SEWER SERVICE CHARGE	
City of Englewood	Inside City Limits	Outside City Limits
Single family unit or dwelling	$15.00	$21.00
Multiple dwelling, apartment houses, motels & tourist Courts:		
1st unit	$15.00	$21.00
2nd unit	$12.00	$16.80
All units in excess of two	$ 7.50	$10.50
Trailer Courts:		
1st trailer unit	$15.00	$19.50
2nd trailer unit	$ 9.00	$11.70
Each additional trailer unit	$ 3.75	$ 4.88
Filling and service stations and commercial garages:		
1st toilet or urinal	$15.00	$19.50
2nd toilet or urinal	$12.00	$15.60
Each additional toilet or urinal	$ 7.50	$ 9.75
Each lavatory, sink, shower or equivalent	$ 1.50	$ 1.95
Each wash rack	$30.00	$39.00
Churches	$22.50	$29.25
Office buildings, hotels, or business establishments:		
1st toilet or urinal	$15.00	$19.50
2nd toilet or urinal	$12.00	$15.60
Each additional toilet or urinal	$ 7.50	$ 9.75
Each lavatory, sink, shower or equivalent	$ 1.50	$ 1.95
Restaurants and Cafes (Without liquor and/or beer license):		
Class "A" (seating capacity for 40 or more patrons)	$45.00	$58.50
Class "B" (seating capacity for 25 to 40 patrons)	$37.50	$48.75
Class "C" (seating capacity for less than 25 patrons)	$30.00	$39.00
Restaurants and Cafes (With liquor and/or beer license):		
Class "A" (seating capacity for 40 or more patrons)	$60.00	$78.00
Class "B" (seating capacity for 25 to 40 patrons)	$52.50	$68.25
Class "C" (seating capacity for less than 25 patrons)	$45.00	$58.50
Beer Parlors (Not in connection with restaurant or cafe)	$30.00	$39.00
Laundries (Including serve-yourself laundries)	$72.00	$93.60
Cleaning plants (When cleaning is done on premises)	$39.00	$50.70
Hospitals, sanitariums, rest homes, dairies, dairy processing plants, automatic car wash establishments, industries, multiple dwelling complexes of more than one structure when served water through a master meter and not otherwise provided for in this schedule; and, shopping center complexes when served water through a master meter: The rates and charges for the above shall be based on 70% of the consumption of metered water during the preceding calendar year.	$30.00 minimum for first 250,000 gallons of sewage and $105.00 per million gallons for all in excess of 250,000 gallons.	$39.00 minimum for first 250,000 gallons of sewage and $136.50 per million gallons for all in excess of 250,000 gallons.
Schools:		
The rates and charges for schools shall be based on 70% of the consumption of metered water during a nine month period commencing September first and ending Mav thirty-first of the preceding calendar year.	$30.00 minimum for 250,000 gallons of sewage and $105.00 per million gallons for all in excess of 250,000 gallons.	$39.00 minimum for 250,000 gallons of sewage and $136.50 per million gallons for all in excess of 250,000 gallons.

1. It reduces or eliminates the need for wastewater agencies to draw funds from general revenues and, as such, may relieve property taxes;
2. It tends to be levied in accordance with extent of use and benefit;
3. The service charge tends to reflect the public utility nature of sewer service, with rates patterned after the electric utility or even the highway form of taxation (highway users trust fund);
4. A user charge is usually more acceptable to the general public and is therefore politically expedient;
5. Organizations which are normally exempt from other forms of taxation, e.g., churches, schools, and military installations, must pay the service charge thereby expanding the revenue base;
6. Such a charge and changes in this revenue form need not go to the voters for public approval.

Hence, the sewer service charge has received widespread use and has much merit. However, there are aspects of the service charge and its computation which conceivably could limit or even negate some of its advantages.

1. It can be an expensive revenue to collect if billed with unnecessary frequency, requires sizeable record-keeping files, and monitoring of user class and possibly sewage outflows;
2. That sewage charge basis which requires the measurement of wastewater use, e.g., MDSDD #1 formula, would appear to be the most equitable. However, few agencies could afford, and perhaps none could find economic justification in separate metering of sewage flows of all users. Consequently, the equity of a charge based on the cost of rendering the service must be compromised;
3. Many agencies use the amount of water use or the amount of water bill as a basis for computing the sewer service charge. However, this method

penalizes several users, e.g., that homeowner who might use above-average amounts of water for lawn sprinkling, swimming pools or gardening. Several of the sampled agencies do recognize this problem, however, and levy a sewer service charge that is based upon average winter water use, e.g., Boulder and Denver;

4. The actual rates established are sometimes arbitrary and may tend to favor a particular class of user. This is the result of not being able to meter the sewage contribution of each user, and to thus not being able to satisfactorily differentiate between users;

5. The use of sliding scales or block rates, while not overly prevalent, could create possible inequities if it enables one class of user (heavy user) to pay less than the cost of service to that class at the expense of another user class. Many factors influence local determination of rates and charges, such as location or cost of service to particular users, decreasing unit costs, the attraction of industry, public acceptance or historical contracts. The pure "quantity discount" is more and more being rejected as acceptable practice.

It appears, then, that all agencies using a service charge attempt to calculate that charge on a reasonably equitable basis with respect to relevant costs. In most cases the sewer service charge is sufficient to pay operating and maintenance cost, debt service, and, to varying degree, recurring capital improvements and system replacement.

Sewer Connection (Tap) Fees

A second important source of revenue for the sampled wastewater agencies is the tap, or connection charge. This fee is payable once, at the time the unit is connected with the sewer main. Of the sixteen sampled agencies, only MDSDD #1 (which has no connections directly to the user) and the City and County of Denver have no tap fee. As previously noted, when Denver actually makes the tap, it charges a fee to cover actual costs.

Table 9 previously listed the revenues generated for each of the sampled agencies in 1970. As shown there, the tap fee revenues constituted an average of 24.9 percent of total revenues for the municipalities (excluding the City and County of Denver), and 13.3 percent of total district revenues (excluding MDSDD #1).

The tap or connection charge is usually designed to recover the costs incurred in constructing and making the connection to the system, perhaps including all or a portion of the costs of the service main. In addition, a permit charge is often included in the tap fee (Arvada, Boulder, Englewood, Pleasant View, and South Adams County) which is meant to recover the cost of the inspection which is made, and which sometimes covers some of the administrative costs. This permit fee is usually about $15-20 per tap. Additionally, some agencies charge what has come to be known as a "plant investment fee." This fee also is included in the tap fee, is a one-time payment, and is used to cover previous (or future) capital investments in sewerage system facilities required to serve the new user. As such it is a "buy in" fee and is somewhat arbitrary in its exact amount. Both the permit fee and the plant investment fee are included in the tap fee data reported on Table 9.

While the service charge has been gaining in use over the years, it appears that the wastewater agencies in Colorado have utilized the tap fee for quite some time. For example, all agencies in the State which responded to a Colorado Municipal League questionnaire in its 1963 study, previously referred to, indicated some form of tap fee in effect.

Just as there are several methods of calculating the sewer service charge, so are there several methods of calculating the sewer connection (tap) charge. Table 13 depicts the bases for the tap fees charged by the sampled agencies and also lists typical residential connection fees.

Of the eight municipalities having a tap charge, five levy a flat per unit charge per residential dwelling unit. These charges vary between $100 (Englewood) and $300 (Littleton and Thornton). Pipe size is used as the basis by one agency (Westminster), pipe size and length dictate another (Boulder), while one bases its residential tap charge on the size of the property served (Englewood). Most of the municipalities charge a higher tap fee for units located outside of the city limit. The districts tend to levy residential tap fees more uniformly than do the municipalities, with five of the six using a flat fee per unit.

For commercial and industrial users the basis for tap fee is more in line with type of use, with only two agencies using a flat fee. Pipe size is the most popular method, while meter size, fixture units and size of unit served are used by other agencies.

The tap fees charged by the various agencies tend to be quite simple, with three typical rate schedules (Thornton, Arvada, and South Adams County) being depicted on Table 14.

Table 13
SEWER CONNECTION (TAP) CHARGES
Selected Municipalities and Sanitation Districts
Denver SMSA
1972

JURISDICTION	BASIS OF CONNECTION CHARGE			TYPICAL CHARGE	
				Residential	
Municipalities	Residential	Commercial	Industrial	Inside City or District	Outside City
Arvada	Per Unit	Per Pipe Size	Per Pipe Size and Location	$115	$240
Boulder	Main Size and Length	Main Size and Length [(a)]	Main Size and Length [(a)]	230 [(b)]	50 [(c)]
Broomfield	Per Unit	Per Unit	Per Unit	150 [(d)]	150 [(d)]
Denver [(e)]	None	None	None	0	0
Englewood	Per Sq. Ft., front foot, or Acre	Per Sq. Ft. or Acreage	Per Sq. Ft. or Acreage	100	115
Littleton	Per Unit	Per Sq. Ft. or Negotiated	Negotiated	300	450
Longmont	Per Unit	Meter Size	Meter Size	200	450
Thornton	Per Unit	Per Pipe Size	Negotiated	300	600
Westminster	Per Pipe Size	Per Pipe Size	Per Pipe Size	180	270
Districts					
MDSDD #1 [(f)]	-	-	-	-	-
Brighton	Per Pipe Size	Per Pipe Size	Per Pipe Size	500	
Fruitdale	Per Unit	Fixture Units	Fixture Units (Contract)	150	
Lafayette	Per Unit	½ of Water Tap Fee	½ of Water Tap Fee	300	
N.W. Lakewood [(g)]	Per Unit	Per Fixture Unit [(h)]	Per Fixture Unit [(h)]	400	
Pleasant View [(g)]	Per Unit	Per Fixture Unit [(h)]	Per Fixture Unit [(h)]	300	
S. Adams County	Per Unit	Per Unit	Per Unit (Negotiable)	200	

(a) In addition, the Plant Investment Fee is based on Meter Size.
(b) In addition, there is a frontage charge based on actual cost which averages $8.00 per front foot.
(c) Tap cost only; all other work done by developer.
(d) Includes $100 Plant Investment Fee.
(e) Denver has no tap or PIF. There is a charge of approximately $40 if the city does the connection itself and a $10 handling fee.
(f) Metropolitan Denver Sewage Disposal District No. 1 has no connection charge as such.
(g) Tap fee plus $350 per acre fee to join the district.
(h) 0 to 19 fixture units equivalent to one residential unit.

SOURCE: Contacts with district and municipal officials.

Table 14
TYPICAL SEWER CONNECTION CHARGE SCHEDULES
Thornton, Arvada, and South Adams County
Denver SMSA
1972

JURISDICTION	SEWER CONNECTION(TAP) CHARGE	
	Inside City Limits	Outside City Limits
City of Thornton		
Residential - per unit (a)	$300	All tap fees in areas outside of the City limits are double that charged inside the City.
Apartments - per unit	$150	
Mobile Home - per space	$300	
Commercial - 4" main	$500	
6" main	$1000	
Industrial - 4" main	$500	
6" main	$1000	
City of Arvada		
Residential - inspection fee	$ 15	$ 15
- Permit fee-first unit	$100	$225
- Permit fee-each additional unit	$ 75	$150
Commercial - inspection fee	$ 15	$ 15
- Permit fee: 4"	$100	$225
6"	$200	$325
8"	$300	$425
Surcharge Fee (b)	$100	$100
Surcharge Fee - Residential (b)	$ 50	$ 50
Surcharge Fee - Commercial (b)	50% of Permit Fee	50% of Permit Fee
South Adams County		
All Classes(c) 4" main	$200	
6" main	$400	
8" main	$600	

(a) Includes churches

(b) A surcharge which is added in certain geographical areas when the cost of serving that area is greater than normal.

(c) Mobile home parks and multi-units are also charged $100 per additional unit or space.

However, some agencies have formulated rather detailed tap fee schedules, with an example of such a schedule on Table 15 (Littleton). The City of Thornton charges a flat fee per residential unit and a graduated fee for commercial and industrial users depending on the size of the main. Thornton doubles its tap fee for those connections made with users located outside of the City limits.

The City of Arvada is an example of an agency which charges a permit fee, an inspection fee, and a surcharge. For residential users the fee is a flat rate per unit, with a lower rate for multiple units so as to recognize lower per unit costs of making the tap. For commercial and industrial users the permit fee is based on pipe size. In addition, Arvada places a surcharge on certain geographical areas where the tap or extension is more difficult and costly to make. Arvada also charges a higher tap fee outside of the City than it does inside.

South Adams County, by comparison, charges a differential fee according to pipe size, but does not recognize, for connection charge purposes, the different user classes.

Just as some agencies have extremely complex service charge schedules, so do some have complex and detailed connection charges. Table 15 depicts the tap fee schedule for the City of Littleton. As shown, the residential fee is a flat charge per unit, while flat charges are also applied to commercial and industrial users. However, Littleton recognizes fourteen different types of users with fourteen different applicable rates. Littleton also charges a greater tap fee in areas outside of the City limits, with that fee being generally one-third greater than the applicable fee inside the City.

The original purpose of the connection (tap) fee was to pay for the costs incurred in making the tap. These costs would include administration, inspection, and the cost of physically making the tap. To this is often added the permit fee and the plant investment fee. However, a change from this original conception of the fee has gradually occurred. At present, many of the jurisdictions charge a tap fee which is well above the actual cost of making the tap. The additional revenue which is generated is often deposited into general operating revenues, often is used to help defray costs of new plant or sewer main construction and expansion, and is sometimes used to retire debt.

Table 15
TYPICAL SEWER CONNECTION CHARGE SCHEDULE
Littleton
Denver SMSA
1972

JURISDICTION	SEWER CONNECTION (TAP) CHARGE	
	Inside City Limits	Outside City Limits
Littleton		
Residential - single family	$300	$450
Apartments - per unit	$300	$450
Mobile Homes - per unit	$300	$450
Hotels and Motels - per unit	$300	$450
Commercial - class I (a)	$300	$450
Commercial - class II (b)	$700	$ 1,050
Commercial - class II (c)	$ 6,000	$ 9,000
Commercial - class II (d)	$ 1,000 per 10,000 sq.ft.	$ 1,500 per 10,000 sq.ft.
Restaurants - 100 seats and over	$12,250	$18,395
- 75 to 100 seats	$ 5,600	$ 8,400
- 50 to 75 seats	$ 3,500	$ 5,250
- up to and including 50 seats	$ 1,750	$ 2,625
Commercial and industrial - class III	Negotiated(e)	Negotiated(e)
Multiple Uses	Largest Applicable	Largest Applicable

(a) Commercial uses add no chemicals, solids, or other materials which would place unusual demands upon the sewer system, e.g., drug stores, furniture stores, camera and photography shops where processing is not done, dry goods stores, shoe stores, etc.

(b) Class II uses place unusual demands on the sewer system. This category of class II would include barber and beauty shops, bakeries, donut shops, photographic studios doing film development, etc.

(c) This category of class II includes automobile service stations, laundromats, car washes, and trailer dumps.

(d) This category of class II includes office buildings and super markets.

(e) Negotiated fee based on the estimated quantity of sewage discharged and upon the effect of the chemicals, solids, or other substances in the sewage.

Special Assessments

Many of the sampled districts and municipalities use special assessments as a means of funding certain improvements to the sewerage system. These assessments are usually levied on a frontage foot basis against those properties which will receive the benefits of the improvement.

The use of a special assessment assures some degree of equity of payment, and also assures that all costs will ultimately be paid. When a special assessment is to be levied, the municipality must give ample notice of the improvement to be made. The assessment is often paid over a period of time and constitutes a lien on the property until it is paid.

Tax Support

A great many different types of tax support might conceivably be used as revenue sources for wastewater systems in Colorado. These could include property taxes, sales taxes, cigarette taxes or other measures. However, the only tax which is presently utilized by any of the sixteen sampled agencies is the ad valorem property tax. The ad valorem tax is the general property tax levied annually on real and personal property as listed with the county assessor.

All of the various wastewater agencies or their parent agencies have the legal authority to levy an ad valorem tax. However, of the sixteen agencies sampled, only four do employ such a tax. These four are all small, special purpose districts,which for various reasons lack an adequate base of wastewater revenues. Fruitdale Sanitation District levies a property tax of 10 mills; Pleasant View Water and Sanitation District levies a property tax of 5 mills; Northwest Lakewood Sanitation District levies a property tax of 5 mills; and South Adams County Water and Sanitation District levies a property tax of 3 mills. For each of these districts the ad valorem tax is a major source of wastewater revenue: Fruitdale 49 percent of all revenues in 1973; Pleasant View 30.5 percent of all revenues in 1970; Northwest Lakewood 89 percent of all revenues in 1970; and, South Adams County 47 percent of all revenues in 1970.

While no other agency reported having a tax levy for direct support of sewerage systems, the City and County of Denver and the City of Longmont have general obligation bonds outstanding which were used to construct wastewater facilities. The retirement of these bonds is paid via the general tax levy rather than from wastewater revenues. As such, these two cities are receiving ad valorem tax support for their wastewater systems.

Of the agencies not receiving tax support, all felt that tax revenues were not required or desirable because other sources of revenue (service charges, tap fees, bonds) were adequate or more equitable. As such, the use or lack of use of the ad valorem tax for wastewater purposes would appear to be a revenue policy question more than anything else. The four agencies that use the property tax have lower sewerage service charges than do the agencies that have no mill levy. Perhaps the cost or responsibility to the County is less than that for the agency to collect service charges.

The mill levy revenues accruing to the four agencies are used primarily to pay off debt service, with some monies going to system replacement and new plant construction. Fruitdale, Northwest Lakewood, and Pleasant View use mill levy monies for operations also, but South Adams County does not.

Federal Sources of Revenue

The primary sources of wastewater revenues are the service charges, tap fees, and long-term debt. However, there are other sources of revenue which are used, or could be used, by the various municipalities and districts studied. One such source is the federal government, with various programs of financial support for wastewater purposes.

During the course of this study it was found that eight of the sixteen agencies received federal grant funds in the last few years. These grants were generally for plant expansion, but some were used for major line extensions. Federal funds were not sought by several of the agencies because no major plant expansion was required. However, in a few cases the agency either failed to apply for the funds or the application was turned down. Nearly all of the agencies presently have pending applications for various types of federal funds. The federal agencies to which the agencies have applied tend to be the Environmental Protection Agency and the Department of Housing and Urban Development. There are several federal programs of grants and loans which can be or have been applied to the planning and implementation of wastewater improvements. However, federal grants, agencies administering grant funds, and the programs themselves have undergone significant changes over the years. The present trend is toward reducing the number of programs and agencies, or curtailment of their funds. This is reflected in frozen funds for such agencies as Farmers Home Administration, Department of Housing and Urban Development, and Economic Development Administration. While the future of these programs is not clear, it is likely that some type of funding for similar program objectives will again be available. At present, only the Environmental Protection Agency is funding wastewater projects.

General revenue sharing is a possible source of monies for wastewater purposes, especially for plant expansion and other capital improvements. However, it does not appear likely that any of the wastewater agencies sampled will be awarded general revenue sharing funds.

Proceeds from Bond Sales

The primary means by which the sixteen sampled agencies pay for major capital improvement and expansion is the issuance of long-term debt. All of the agencies have legal authority to incur debt and all have made use of this authority. Table 16 describes the status of each of the sampled agencies' bonded indebtedness, bond characteristics and an abbreviated bond retirement schedule.

Of the twenty-three bond issues listed, fifteen are revenue bonds, three are refunding revenue bonds, and five are general obligation bonds. A revenue bond is debt which is secured by a pledge of revenue which is to be derived from the revenue-producing sewerage system. A general obligation bond is secured by the full faith and credit and by the general taxing power of the issuer. Refunding bonds are issued to obtain money to retire other outstanding bonds, usually in order to secure a more favorable interest rate or to change the conditions of the indenture. The reasons for the heavy use of revenue bonds are probably numerous, but they appear to revolve around the fact that revenue bonds do not constitute an indebtedness "within the meaning of any constitutional or statutory limitations." In other words, revenue bonds are not subject to the legal debt limit. This enables the general obligation bonds that are subject to the legal debt limit to be used for such non-revenue producing public needs as schools and libraries. Another reason why revenue bonds are so frequently utilized, particularly by municipalities, is that they

Table 16
LONG-TERM DEBT
Selected Municipalities and Sanitation Districts
Denver SMSA
1972

JURISDICTION Municipalities	SEWERAGE SYSTEM BONDED INDEBTEDNESS-1972	BOND CHARACTERISTICS				BOND RETIREMENT		
		Type	Year	Maturity	Issue Amount	1972	1976	1980
Arvada	$ 815,000	Revenue	1965	N.A.	$330,000			
		Revenue	1968		700,000	$85,000	$ 86,425	$ 95,300
Boulder	3,375,000	Ref.Rev.	1962	1980	600,000			
		Revenue	1966	1990	2,775,000	247,027	248,215	247,105
Broomfield	321,000	Revenue	1963	1983	104,000			
		Revenue	1968	1996	250,000	23,087	23,867	23,518
Denver	20,320,000 [a]	Gen.Oblig.	1955	1975		N.A.	N.A.	N.A.
		Gen.Oblig.	1972		20,000,000			
Englewood	651,000	Ref.Rev.	1962	1980	595,000	72.412	75,650	77,251
Littleton	710,000	Revenue	1959	N.A.	N.A.	N.A.	N.A.	N.A.
		Revenue	1970					
Longmont	803,000	Gen.Oblig.	1964	1976	338,000			
		Revenue	1969	1989	650,000	78,395	77,650	70,300
Thornton		Revenue	1963	2003	1,705,000			
		Revenue	1971	1992	800,000	126,593	148,093	148,211
Westminster	1,450,000	Ref.Rev.	1971	1991	1,450,000	24,047[b]	299,965	332,405
Districts								
MDSDD #1	31,665,000	Revenue	1964	2003	32,500,000	1,339,995	1,492,870	1,642,260
Brighton	1,071,000	Revenue	1972	1991	875,000	76,827	74,840	76,665
Fruitdale	None	Revenue	1952	1972	165,000	0	0	0
Lafayette	307,000	Revenue	1965	1985	136,000	19,237	24,787	30,115
		Revenue	1971	1989	190,000			
N.W. Lakewood	40,000	N.A.	1955	1974	297,000	21,950	0	0
Pleasant View	97,715	Gen.Oblig.	1958	1978	224,000	18,125	17,650	0
South Adams	533,000	Gen.Oblig.	1957	1973	1,800,000	N.A.	0	0

(a) These are obligations of the City and County of Denver and not of the Wastewater Division.
(b) Interest only.

N.A. - Not Available.

need not be put to a vote of the public and the provisions for their issuance are sometimes less stringent than those for general obligation bonds.

Most of the outstanding bonds of the sampled agencies are issued for a period of twenty years, although there are some thirty and even forty year bonds outstanding, particularly in the case of the larger issue amounts. The longest period for which debt can legally be issued is forty years.

The annual retirement cost of outstanding debt (principal and interest) varies, of course, depending on the rate of interest, retirement schedule and the maturity dates. However, there is also great variation in the use of debt. For example, the cost of debt retirement (principal and interest) in 1970, as a percentage of total 1970 wastewater expenditures, varied between 53.8 percent for South Adams County and 10.2 percent for Northwest Lakewood. The average debt payment as a percent of total expenditures for all the sampled agencies (excluding MDSDD #1 and the City and County of Denver) in 1970 was 20.7 percent.

The bonds which are presently outstanding were used primarily for new plant construction and in a few instances for major interceptors and main extensions. The debt service is normally paid off via general system revenues (usually service charges), although the agencies using a mill levy tend to dedicate this revenue to bond retirement. Indeed in a few cases, if new bonds were issued, the tax levy would increase by the amount necessary to pay the projected debt retirement cost.

Revenue Trends

During the course of this investigation, certain trends regarding wastewater revenues were observed. Most of them, however, are quite obvious and logical. The overall revenue trend is, of course, upward. Gross receipts from service charges and tap fees are increasing for all agencies, partly because of increasing service charge rates and tap fees, but primarily because of the growth within the Denver SMSA.

Table 17 summarizes the frequency with which service charge and tap fee charges are increased. The near-term trend appears to be to change such rates frequently, usually every three years or so, with the frequency being related to the pace of growth and costs. It appears that it is

Table 17
FREQUENCY OF RATE CHANGES
SEWER CONNECTION (TAP) FEES AND SERVICE CHARGES
Denver SMSA
1968 - 1973

JURISDICTION	HISTORIC RATE CHANGES					
Municipalities	1973	1972	1971	1970	1969	1968
Arvada		S	S			
Boulder			S&T	S		
Broomfield				S		
Denver			S		S[e]	
Englewood			S&T		T	
Littleton		S&T				
Longmont	S		T			
Thornton		S[b]&T				
Westminster	T	S				
Districts						
MDSDD #1 [a]	S	S	S	S	S	S
Brighton	S&T	Ⓢ&Ⓣ&Ⓟ		S		
Fruitdale		T			S[f]	
Lafayette			S[d]&T		S(g)	
N.W. Lakewood				T		
Pleasant View		S&T[c]				S
South Adams		T				

S - Service charge rate change
T - Tap fee rate change
P - Plant investment fee change
Ⓢ; Ⓣ; Ⓟ: - new revenue source instituted

(a) MDSDD #1 service charge changes every year, although the formula does not change.
(b) Mobile homes only.
(c) Single-family residential remained constant.
(d) Commercial only.
(e) Denver Water Board increased water rates. Therefore sewer charges also increased.
(f) Service charge decreased from $3.00 to $2.00 per month.
(g) Residential only.

SOURCE: Contacts with district and municipal officials.

relatively simple to obtain small rate increases in both the service charge and the tap fee, but governing bodies of both municipalities and districts display the same aversion as their constituents to large rate increases.

In addition, there is a trend toward the utilization of new revenue sources. For example, some agencies have instituted new fees rather recently, and several other agencies are presently looking for new sources of revenue. One reason for the need for increased revenues entails the increasing demands placed on the system. Another, however, is increased costs which are coming about as a result of inflation, plus those costs attendant to increasingly stringent federal and state regulations.

Revenue trends and projections of this nature are not meaningful except when compared with similar expenditure estimates and their causes. Revenue and expense projections and trends are discussed together in a later section of this report.

Revenue by User Class

An important variable in this study and one about which, unfortunately, there is very little information, is revenue by user class. The traditional user classification consists of residential, commercial, and industrial, with public or institutional use sometimes a fourth category. By comparing sewage contribution and costs of supplying service to each class with revenues generated by each of these classes, it is possible to determine whether or not the existing rate structure is equitable. Every attempt was made to generate the data necessary to determine the equity of the rate structures. However, of the agencies sampled in this study, (excluding MDSDD #1), only two had the data necessary to indicate revenues by user class.

When classifying different types of land use, structures, or other forms of development or use, the traditional method is to classify along the lines of structure use. For example, a living place would be residential, any form of retail or wholesale outlet or office building would be commercial, and industrial might be light or heavy industry. In classifying types of sewer users, however, a different classification criteria scheme may be required. For wastewater purposes the most appropriate indicator of user type is the volume, strength, and type of demand placed on the sewer system. As such, it is not the use of the structure itself, but is rather the characteristics of the demand upon the sewerage system, which most aptly permits assigning users to classes. The Standard Industrial Classification Manual, Office of Management and Budget, 1972, affords guidance in subclassifications which recognize variations in industrial wastes.

The City and County of Denver maintains records by user class, with the classes differentiated according to demands placed on the sewer system. In 1970, of $4,710,700 collected in service charges from within the City and County, 55.7 percent came from residential users, 0.6 percent from City and County use, 33.7 percent from commercial and industrial users, and 10.0 percent came from industrial users which discharged industrial wastes into the sewer system.

Unfortunately, few agencies maintain such detailed records. Nearly every agency contacted felt that it would be useful to have such user-revenue information but, because of their limited size or resources, could not afford to maintain such records. As there is a trend toward electronic data processing, however, and opportunities for cooperative action, it may be that such information could be generated in the future.

This is not to say, however, that this type of information cannot now be obtained. Each jurisdiction has in its files the data necessary to compile user class information. However, it would be a very tedious job to go through every account to compile the necessary information. In addition, the definitions of what constitutes a residential, commercial, or industrial user appear to vary considerably from agency to agency.

In addition to revenue by user class, the sampled agencies also had very little information regarding other aspects of wastewater service by user class. Every agency was asked for the number of sewer connections by user class. Only three agencies maintained records showing the number of residential, commercial, and industrial connections they had, although the rest of the agencies could estimate the user connections by class fairly adequately. Table 18 depicts the approximate number of connections by user class for each of the agencies. As is to be expected, the residential users greatly outnumber the other classes of users.

Failure to recognize the differing wastewater characteristics of user classes may connote that preferential treatment occurs to some. However, no agency policies were detected that sought other than equity or to grant rates that appeared

Table 18
SEWER CONNECTIONS BY CLASS OF USER
Selected Municipalities and Sanitation Districts
Denver SMSA
1972

	NUMBER OF TAPS						
JURISDICTION	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		TOTAL
Municipalities	Number	Percent	Number	Percent	Number	Percent	
Arvada	N.A.	-	N.A.	-	17	0.1	14,392
Boulder (a)	14,627	91.8	1,100	6.9	200	1.3	15,927
Broomfield (a)	2,135	97.0	60	2.7	5	0.3	2,200
Denver	110,229	85.5	18,520	14.4	121 (d)	0.1	128,870
Englewood	19,746	93.3	1,415 (c)	6.7	- (c)	0.0	21,161
Littleton	N.A.	-	N.A.	-	2	0.0	8,000
Longmont	7,331	93.2	539 (c)	6.8	- (c)	-	7,870
Thornton	15,297	97.1	454 (c)	2.9	- (c)	0.0	15,751
Westminster (a)	5,198	96.4	191	3.6	1	0.0	5,390
Districts							
MDSDD #1 (b)	-	-	-	-	-	-	226,900
Brighton (a)	2,342	88.9	292	11.1	0	0.0	2,634
Fruitdale (a)	552	93.4	38	6.4	1	0.2	591
Lafayette	1,142	91.4	103	8.2	5	0.4	1,250
N.W. Lakewood (a)	3,900	97.7	90	2.3	0	0.0	3,990
Pleasant View (a)	980	98.0	15	1.5	5	0.5	1,000
South Adams (a)	4,466	79.7	1,140 (c)	20.3	- (c)	-	5,606

(a) Statistical differentiation between user classes not available. These figures are approximations made by appropriate municipal and district officials.

(b) Metropolitan Denver Sewage Disposal District No. 1 has no direct connections to homes or businesses.

(c) Commercial and industrial combined.

(d) Industrial wastes.

N.A. - Not Available

Note: Public facilities, e.g., schools, libraries are included as commercial.
In most cases the industrial class is defined by sewage discharge rather than type of business establishment.

on the surface to be out of line with the cost of supplying the service. This is not to say, however, that no such instance exists. Several instances of sliding rate scales (quantity discounts) do exist which might tend to favor one user class over another. Several agencies enter into negotiated contracts with specialized users. These individual contracts were not reviewed during this study, and their effects cannot be reported.

A very real alternative to "total equity" might occur where a municipality desires to attract a specific employer and, to obtain the relocation, grants that commercial or industrial establishment a preferential (lower) rate. Again, while no examples of such an action were found, it may be that preferential treatment does exist. However, given the trend toward less emphasis on industrial expansion, it is likely that the motivation for preferential rate-making is on the decline.

Constraints on Revenue Production

Representatives of each of the sixteen agencies were asked for comments regarding constraints and problems regarding the production of wastewater revenues. Every agency acknowledged that there were constraints, but that the constraints were very reasonable and that there were no undue problems affecting their ability to raise sufficient revenues.

All agencies expressed the desire to receive federal grants for various wastewater projects, but many indicated a belief that they would have difficulties in obtaining such loans and grants, primarily because of size and scale of operation. However, the general tone of the comments indicated little criticism of the manner in which federal programs were implemented. Rather, the agencies appeared to be appreciative of the programs available to them and expressed the hope that the amounts of federal monies available through such programs could be expanded. One constraint on the use of federal funds that did appear in the discussions, however, is the initial failure of local agencies to apportion general revenue sharing monies for wastewater purposes. This, however, is a decision made by the local governmental entities rather than by the federal government.

There are legal and practical constraints on the production of revenue which must be observed by the wastewater agencies, but no agency indicated any hardship resulting from such constraints. For example, annual tax levies by municipalities and special districts are prohibited by statute (Chapter 88, Article 3) from being raised by more than five percent from the preceding year, except to provide for the payment of bonds and interest. As already indicated, only four agencies levy a property tax for wastewater purposes, and these four use much of the levy to pay off bond principal and interest. In addition, any increase in the levies would be a result of a new bond issue and consequently would be exempt from this revenue restriction. The statutes also stipulate that the municipality or district may increase the levy by more than five percent with the approval of the Colorado Tax Commission, or upon a simple majority vote of the electors. Of the wastewater agencies with no property tax support, none expressed interest in the ad valorem tax as a revenue source. As a result of these legal and policy practices, the statutory constraint on the mill levy is not really a constraint on wastewater revenue production.

As already discussed, the revenue bond is a major source of revenue for capital improvements for the wastewater systems in the Denver area. The legal constraints on the issuance of revenue bond are not severe. All municipalities and special districts have the authority to issue revenue bonds for wastewater purposes, which do not constitute an indebtedness of the municipality as regulated under the bonded indebtedness limitations. One constraint that does apply is the maximum allowable interest rate of six percent per annum. This, however, has not proved to be a deterrent to revenue bond financing because the rates, as a result of tax exemptions on municipal bonds, can be less than six percent and yet make it possible for the bonds to be readily sold.

Municipalities also have the authority to issue general obligation bonds for wastewater purposes. The general obligation bond is one which pledges the full faith and credit (taxing power) to the retirement of the bonds. The total indebtedness of the municipality cannot exceed three percent of the total assessed valuation of the taxable property, except such debt as may be incurred in water supply and waterworks. This would appear to be a sizeable constraint on this source of wastewater revenue, except that municipalities can increase the debt ceiling by majority vote of the tax-paying electors. In addition, the trend appears to be toward the use of revenue bonds rather than general obligation bonds for financing sewerage systems. One important constraint on the use of bonds is the response of the electorate to bond issues which, for the most part, must be placed before them for approval.

Constraints on the use of, and increase of, tap fee and service charge rates also do not appear to hinder the operations of the wastewater agencies. As depicted earlier, almost all of the agencies have been able to increase service charge rates and/or tap fees as the need arises. Normally the city council (for the municipalities) and the Board of Directors (for the districts) can increase these rates quite easily. Very seldom do such rate changes go before the public for a vote. The apparent rate policies appear to be to charge whatever rate is both needed and reasonable.

It has been suggested in several sections of this report that a comparison, agency by agency or on a per capita basis, of rates charged is an invalid exercise unless pertinent cost factors are also applied. Without proper consideration of these variables, the only appropriate conclusion is that every agency charges its users something and some charge more than others. Even among certain agencies, however, there is a tendency to refer to their rates as being "in line" with those of a neighboring agency, which is hardly a criterion for evaluating rates.

WASTEWATER EXPENDITURES

Analysis of wastewater expenditures, in contrast to wastewater revenues, is a relatively difficult task because of the lack of uniform accounting procedures for the various agencies. The cost of contractual treatment charged by the Metropolitan Denver Sewage Disposal District No. 1 is readily analyzed, as is long-term debt. Capital outlays, costs of operations and maintenance, transfers between funds, and so on, however, are more difficult.

An attempt was made to categorize the expenditures of the sampled agencies and this is summarized on Table 19. The expenditure classes are very broad because of the problems encountered due to accounting systems. The annual cost of debt is quite accurate because of the bond retirement schedules required when issuing bonds. As shown, the cost of debt as a percent of total annual expenditures (excluding MDSDD #1 and the City and County of Denver) averages approximately 20.7 percent. This cost varies between a high of 53.8 percent in South Adams County and a low of 10.2 percent in Northwest Lakewood.

Contractual treatment payments to MDSDD #1 also vary considerably as a percent of total annual expenditures. The variance here is between 33.7 percent (Northwest Lakewood) and 60.7 percent (Denver). In addition, of course, are the agencies which have no such charge because they are not members of MDSDD #1.

The capital outlay classification is not exacting because of the difficulty in defining capital outlays, and the problems in differentiating between recurring and nonrecurring capital expenditures. An attempt was made to exclude major, one-time capital expenditures but this was not always possible.

The general fund classification consists of those monies which are appropriated and transferred from wastewater agency revenues to the general fund, either the water and sewer general fund or the municipality's general fund. The amount transferred usually represents the wastewater agency's cost for billing and accounting if centrally performed with other billings, e.g., water, garbage, or taxes, but may include an amount to reimburse other departments for construction or administrative costs incurred in support of the wastewater system. As shown, only in Brighton and Longmont is this transfer very large (22.9 and 22.3 percent of annual expenditures respectively). While occasionally referred to as a "payment in lieu of

Table 19
WASTEWATER EXPENDITURES
Selected Municipalities and Sanitation Districts
Denver SMSA
1970

JURISDICTION	OPERATIONS AND MAINTENANCE		GENERAL FUND		CAPITAL OUTLAY		CONTRACTUAL TREATMENT (a)		DEBT		TOTAL
Municipalities	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount
Arvada	$111,756	21.1%	$28,000	5.3%	$117,275	22.2%	$187,352	35.4%	$84,315	16.0%	$528,698
Boulder	449,470	29.4	25,600	1.7	818,887	53.6	None	0.0	234,884	15.3	1,528,841
Broomfield (c)	29,850	16.9	8,897	5.0	114,900(b)	64.8	None	0.0	23,640	13.3	177,287
Denver	2,032,066	36.3	0	0.0	170,145	3.0	3,405,481	60.7	0(d)	0.0	5,607,692
Englewood	181,376	46.5	11,486	3.0	121,479	31.1	None	0.0	75,851	19.4	390,192
Littleton	75,273	43.9	7,500	4.4	35,363	20.6	None	0.0	53,465	31.1	171,601
Longmont	129,242	41.2	70,000	22.3	29,070	9.2	None	0.0	85,600	27.3	313,912
Thornton	107,669	17.2	0	0.0	4,047	0.6	418,224(i)	66.9	95,346	15.3	625,286
Westminster (c)	89,712	27.1	0	0.0	4,193(e)	1.3	121,593(j)	36.6	116,121	35.0	331,619
Districts											
MDSSD #1 (f)	3,019,195	62.7	0	0.0	438,193	9.1	0	0.0	1,360,606	28.2	4,814,315
Brighton	22,980	35.0	15,000	22.9	8,639	13.2	None	0.0	19,000(h)	28.9	65,619
Fruitdale (1971)	35,224	40.5	0	0.0	990	1.1	35,361	40.6	15,520	17.8	87,095
Lafayette	34,192	68.8	5,500(g)	11.1	500	1.0	None	0.0	9,477	19.1	49,669
N.W. Lakewood(1971)	76,095	36.0	0	0.0	42,470	20.1	71,302	33.7	21,568	10.2	211,435
Pleasant View (c)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	18,753	N.A.	17,950	N.A.	N.A.
South Adams	90,860	34.7	0	0.0	30,000	11.5	None	0.0	140,750	53.8	261,610

(a) Treatment cost charged by Metropolitan Denver Sewage Disposal District No. 1
(b) Main extension which Broomfield paid through a developed area. Normally the developer would pay this.
(c) Sewer and water records are combined. Figures shown here are approximations of actual wastewater expenditures.
(d) Denver has wastewater bonds outstanding, but they are paid out of the mill levy, not out of wastewater revenues.
(e) Excludes bond issue and consequent major capital expenditure in 1970.
(f) Metropolitan Denver Sewage Disposal District No. 1 is 1971 data.
(g) Approximation because general fund transfer not detailed in 1970.
(h) Principal only.
(i) Estimate includes other expenses. Amount actually paid MDSSD #1 is $255,695 or 40.9 percent of total 1970 Thornton expenditures.
(j) Estimate includes other expenses. Amount actually paid MDSSD #1 is $82,332 or 24.8 percent of total 1970 Westminster expenditures

Note: Several expenditures are budget estimates rather than actual amounts; because of inter-fund transfers, total expenditures and total revenues may not be same amount.

SOURCE: Contacts with district and municipal officials; official records.

taxes," no instance was found of a specific calculation of the amount of taxes the system would pay if it were a private utility, so that the reference appears to be figurative only.

The operations and maintenance classification is a catch-all account of all remaining expenditures. Included is the cost of collection, administration, and treatment (for non-MDSDD #1 members). It had been planned to analyze the expenditures associated with each functional area, e.g., administration, collection, treatment, and disposal. However, only a few of the sampled agencies maintain records of a detail from which such information can be accurately derived. Additionally, cost comparisons like rate comparisons are not valid without full examination of all cost factors. In the following sections a more detailed description of expenditures and expenditure trends is made.

Contractual Payments

An important element of expense is the cost of membership in MDSDD #1. While no detailed analysis was made of this expense, the trends and statistics should be of interest to members and non-members alike.

All of the fifteen sampled wastewater agencies which collect sewage must provide for its subsequent treatment and disposal. Eight of the agencies provide their own treatment, while seven of the sampled agencies transmit at least a portion of their sewage to the Metropolitan Denver Sewage Disposal District No. 1 for primary and/or secondary treatment. The seven agencies which transmit their sewage to the MDSDD #1 do so on a contractual and membership basis. It is the financial arrangement between these seven agencies and the MDSDD #1 with which this section is concerned.

Each of the twenty-one members of MDSDD #1 are charged an annual service charge (actually paid quarterly) in accordance with a service contract. The annual service charge is uniform for each user classification and is based on the volume and strength of wastewater delivered to the system. The service charge is calculated, prescribed, and can be revised, and is collected so that the charge will be sufficient:

> To pay at all times all Operation and Maintenance Expenses and at the end of each Fiscal Year to maintain therefore reserve requirements;

> To provide in each Fiscal Year a sum equal to the Debt Service for the Bond Year commencing in such Fiscal Year computed as of the beginning of such Bond Year;
>
> To provide at all times for any deficits of the District resulting from failure to receive any Annual Charges or any sums payable to the District by any Municipality or from any other cause;
>
> To provide at all times such sums for reserves and for sinking funds as may be fixed by this Service Contract or other contract of the District or as may be otherwise determined from time to time by the Board (subject to any existing contractual limitations);
>
> To provide moneys required by any contract of the District or otherwise for any capital expenditure, including without limitation Acquisitions, Improvements, Extensions, and Alterations, or any other purpose authorized by the Act (not hereinabove provided) and as so determined by the Board; and
>
> To comply at all times in all respects with the terms and the provisions of any resolution of the Board and of the Act and to pay and to discharge all other charges or liens payable out of the income of the System when due and enforceable (Article V, Section 503, Sewage Treatment and Disposal Agreement, January, 1964).

In order to uniformly charge its members for the volume and composition of sewage transferred to the MDSDD #1 system, the District has the right to "enter upon and to inspect the Sewer System of the Municipality or any industrial or commercial installations connected thereto or any other connections which contribute sewage or wastes to the local Sewer System and to take normal samples under ordinary operating conditions and to make tests, measurements, and analyses of sewage or other wastes in entering, or to be discharged to the Sewer System." (Article IV, Section 405, Sewage Treatment and Disposal Agreement, January, 1964).

In order to charge uniform and equitable rates, a formula is used and is applicable to all members of the MDSDD #1. This formula entails three variables upon which the annual charge is based.

Flow - The measurement, in millions of gallons annually, which is placed into the MDSDD #1 system from each member district.

BOD - Biochemical Oxygen Demand which is the laboratory determination of the quantity of oxygen utilized in the biochemical oxidation of organic matter in a given time and at a specified temperature, being expressed in parts per million (ppm) or (mg/liter) of oxygen used in a period of five (5) days at 20° C.

SS - Suspended Solids which is the laboratory determination of dry weight expressed in parts per million (ppm) or (mg/liter) of solids that either float on the surface or are in suspension in sewage and can be removed from sewage by filtration.

MDSDD #1, before the discharge and delivery of wastes into its system, calculates an initial schedule of unit charges and distributes this to each member. From it, annual charges are estimated for the forthcoming year for each member. This schedule serves as the basis for that year's charge. After the year is over and actual flow, Biochemical Oxygen Demand (BOD) and Suspended Solids (SS) are known in total and for each member, the actual charge can be computed. Any overpayment or underpayment is then debited or credited to the account of the member agency. Overpayments are not usually refunded but rather are deducted from the next year's estimated annual service charge.

Table 20 summarizes the computation of the estimated annual per unit charge for 1973. As shown, the total estimated cost is, as always, divided 45.51 percent for flow, 30.88 percent for BOD, and 23.61 percent for Suspended Solids. Total volume and strength are then estimated and per unit charges (per million gallons of flow, per ton of BOD, and per ton of SS) are calculated. This per unit figure is applied to the estimated flow, BOD, and SS accruing from each member agency and each agency's charge can then be estimated.

Table 21 summarizes the calculation of each of the sampled agencies' 1973 estimated service charge to MDSDD #1. Shown on this table is each agency's estimated flow, BOD, and Suspended Solids, plus the result of the applied unit charge. This is the charge that each agency will pay in

Table 20
CALCULATION OF UNIT CHARGES
Metropolitan Denver Sewage Disposal District No. 1
Estimated 1973

Total Annual Charges (estimated)	$5,774,452
Less: Availability of Service Charge	2,000
Remainder Allocated to Members	$5,772,452
Allocation Percentages:	
Flow 45.51%	$2,627,043
BOD 30.88%	$1,782,533
SS 23.61%	$1,362,876
Total Volume and Strength:	
Flow (MG)	46,347
BOD (Tons)	35,899
SS (Tons)	29,748
Calculation of Unit Charges (Volume and Strength)	
Flow = $\frac{\text{Total Annual Flow Charge}}{\text{Total Flow to System}}$	$\frac{\$\ 2,627,043}{46,347}$
Unit Charge per Million Gallons (Flow)	$ 56.6820
BOD = $\frac{\text{Total Annual BOD Charge}}{\text{Total Tons BOD to System}}$	$\frac{\$\ 1,782,533}{35,899}$
Unit Charge per Ton (BOD)	$ 49.6541
SS = $\frac{\text{Total Annual SS Charge}}{\text{Total Tons SS to System}}$	$\frac{\$\ 1,362,876}{29,748}$
Unit Charge per Ton (SS)	$ 45.8140

SOURCE: Metropolitan Denver Sewage Disposal District No. 1

Table 21
VOLUME, STRENGTH, AND ANNUAL CHARGE
Wastewater Treated By Denver Metropolitan
Sewage Disposal District No. 1
Sampled Agencies
Estimated 1973

AGENCY	FLOW		BIOCHEMICAL OXYGEN DEMAND		SUSPENDED SOLIDS		TOTAL CHARGE
	Million Gallons	Charge	Tons	Charge	Tons	Charge	
Arvada	1,767	$ 100,157	1,325	$ 65,792	1,590	$ 72,844	$ 238,793
Denver	35,541	2,014,537	25,577	1,270,004	16,782	768,851	4,053,392
Northwest Lakewood	803	45,516	369	18,322	369	16,906	80,744
Pleasant View	307	17,401	209	10,378	384	17,593	45,372
Thornton	2,409	136,547	2,409	119,617	3,011	137,946	394,110
Westminster	785	44,495	722	35,850	1,021	46,776	127,121
Fruitdale	281	15,928	360	17,875	174	7,972	41,775
Subtotal (sampled members)	41,893	$2,374,581	30,971	$1,537,838	23,331	$1,068,888	$4,981,307
Total MDSDD #1 (all 21 members)	46,347	$2,627,043	35,899	$1,782,533	29,748	$1,362,876	$5,774,452

SOURCE: Metropolitan Denver Sewage Disposal District No. 1

1973. In 1974, the exact figures will be calculated for 1973 and adjustments will be made.

While the rates charged each member are uniform per unit, the annual payment by the member agency for treatment as a percentage of its total operating budget varies considerably. For example, as a percent of total expenditures (excluding major capital outlays), the MDSDD #1 treatment charge was 33.7 percent of Denver's expenditures in the same year. In addition, the contractual treatment charge was 35.4 percent of Arvada's total expenditures, 40.9 percent of Thornton's, 24.8 percent of Westminster's, and 40.6 percent of Fruitdale's. These percentages, however, should not be compared without examining the characteristics of the respective wastes, and whether all or only part of their treatment is provided by MDSDD #1.

The formula, using present percentages of flow, BOD and SS, has not changed since its inception in 1964. However, the annual charges levied against each member have increased gradually. Table 22 depicts these increases for each of the seven member sampled agencies. The total annual charge increase between 1967 and estimated 1973 is a gain of approximately 59.8 percent for the sampled agencies. The effect of decreased buying power of 1973 vs. 1967 dollars is evident. Also, due to area growth, this increase could be the result of any one or more of four cost factors: 1) increasing flow volumes from the member agencies; 2) increasing BOD tonnage; 3) increasing suspended solids tonnage; 4) increased costs of providing and operating the MDSDD #1 system. All of these costs are passed on to the members. The changes in each of the four variables between 1967 and estimated 1973 are depicted on Table 23. Because several members were added after 1967, the initial figures refer only to members in 1973 that were also members in 1967.

As shown on Table 23, the increasing service charges passed on to the MDSDD #1 members are primarily attributable to increasing flows and to increasing costs per unit. BOD has not increased significantly from the sampled members, and suspended solids have actually declined. As noted previously, the formula for calculating charges, based on pre-set percentages of flow, BOD and SS, has not been revised since its inception. Whether the formula provides incentives to members to pre-treat their wastes before delivery to MDSDD #1 was not determinable from this study.

This would seem to indicate that the costs of operating Metropolitan Denver Sewage Disposal District No. 1 may be increasing faster than originally anticipated. However,

Table 22
ANNUAL TREATMENT CHARGES TO MEMBERS OF METROPOLITAN DENVER SEWAGE DISPOSAL DISTRICT NO. 1
Denver SMSA
1967 - 1973

SAMPLED MEMBER	ANNUAL CHARGE 1967 Adjusted	1968 Adjusted	1969 Estimated	1970 Estimated	1971 Adjusted	1972 Estimated	1973 Estimated
Arvada	$ 158,474	$ 143,806	$ 171,786	$ 200,827	$ 194,816	$ 197,808	$ 238,793
Denver	2,706.693	3,004,453	2,981,737	3,451,370	3,571,344	3,940,241	4,053,392
Northwest Lakewood	54,711	42,662	37,417	50,080	70,362	70,712	80,744
Pleasant View	-	15,681	26,013	19,904	37,953	34,699	45,372
Thornton	146,943	225,069	293,394	263,369	316,780	297,124	394,110
Westminster	51,303	53,300	37,174	40,836	121,593	128,358	127,121
Fruitdale	-	14,081	15,281	19,678	33,848	35,590	41,775
Subtotal (sampled members)	$3,118,124	$3,499,052	$3,562,802	$4,046,064	$4,346,696	$4,704,532	$4,981,307
Total MDSDD #1 (all 21 members)	$3,313,022	$3,728,408	$4,023,857	$4,537,142	$4,978,765	$5,283,276	$5,774,452

SOURCE: Metropolitan Denver Sewage Disposal District No. 1

Table 23
VOLUME, STRENGTH, AND PER UNIT CHARGE TRENDS
Sewage Intercepted by Metropolitan Denver Sewage Disposal District No. 1
1967 and Estimated 1973

Volume	1967 Adjusted	1973 Estimated	PERCENT CHANGE 1967 - 1973
Flow (mg) [(a)]	29,768	41,305	38.8
BOD (tons) [(a)]	27,051	29,680	9.7
SS (tons) [(a)]	25,042	22,773	- (9.1)
Annual Charge per Unit			
Flow Charge per mg	$49.0755	$56.6820	15.5
BOD Charge per ton	$35.5458	$49.6541	39.7
SS Charge per ton	$27.7811	$45.8140	64.9

(a) Includes only Arvada, Denver, Northwest Lakewood, Thornton, and Westminster. Excludes Pleasant View and Fruitdale because they did not belong to MDSDD #1 in 1967.

SOURCE: Metropolitan Denver Sewage Disposal District No. 1.

in 1972 the District served approximately 944,000 persons for a per capita annual service charge of approximately $5.59. This cost estimate includes all wastes treated, including commercial and industrial. This calculates to be a service charge of approximately $0.47 per person per month. In addition, stricter federal and state wastewater regulations would appear to be causing some of the increasing cost trend, as is inflation. It would appear, then, that the cost trend is upward but that the cost per person or per tap may still be quite reasonable as a reflection of treatment and disposal costs.

Expenditures by Function

The principal functions associated with wastewater service are collection, treatment and disposal. To these are added other expenditure elements which are associated support functions: administration, billing, accounting; plus capital expenditures, and the payment of debt service. The analysis of expenditures, to focus upon pertinent costs of operation, must distinguish between the functional costs of collection, treatment and disposal.

These various cost elements were compared for the various sampled agencies, permitting certain conclusions to be reached. However, it must be emphasized that the comparisons were quite difficult and, indeed, quite impossible in some instances. This is because the agencies individually exercise substantial freedom and flexibility in their systems of accounts. The agencies do nominally comply with the State Auditor's uniform system of accounts, but both the degree of compliance and the basic system pose inadequacies for comparative analyses, or for realistic budgeting and cost accounting.

Most of the sampled agencies do not organize their classification of expenditures to reflect the costs of collection, treatment and disposal. Even those which do differentiate the costs of the various functions do so with varying definitions and practices as to what is included in the established cost categories. For example, some agencies allocate administrative costs between treatment and collection and some do not.

Nevertheless, some analysis was possible. Table 24 lists, as well as possible, the expenditures for certain of the sampled agencies. Most of the sampled agencies that are not listed on Table 24 have accounting practices which do not separate treatment and collection, or do not separate

Table 24
EXPENDITURES BY FUNCTION
Selected Municipalities and Sanitation Districts
Denver SMSA

COST ITEM	BOULDER (1970 Actual)	LAFAYETTE (1970 Estimated)	DENVER (1970 Estimated)	LITTLETON (1971 Actual)	ENGLEWOOD (1970 Actual)
Administration	$ 16,490	$20,443	$ 308,016	$ 10,368	$ 24,492
Sewage Collection	109,064	12,075	726,972	148,812	34,645
Sewage Treatment	253,777	13,005	4,049,496	75,508	92,863
Billing	70,139	-	-	-	16,351
Debt	234,884	9,477	-	69,428	75,851
Capital	818,887	-	-	5,000	121,479
General Fund	-	-	-	-	11,486
Engineering	-	-	348,972	-	-
Contracts	-	-	-	-	13,025
Quality Control	-	-	207,255	-	-
General Expense	25,600	-	-	-	-
TOTAL	$1,528,841	$55,000	$5,640,711	$223,240	$390,192

Note: Because an agency lists no expenditure for a specific cost item does not necessarily mean that agency incurred no such cost. Rather, it might mean that the accounting system does not separate that cost category from the other cost categories.

SOURCE: Audits or budgets of respective agencies.

water and sewer expenses, or maintain a system of accounts that cannot be compared with those of the other agencies.

As shown, treatment operating costs constitute a major portion of each agency's total annual expenditures, with the operating costs of collection usually being much less. Treatment operating costs compared to collection operating costs vary considerably, however, between the agencies. This is due to the different methods and arrangements by which sewage is treated, the variance in collection systems and types of users, the fact that some agencies are expanding thereby requiring sizeable investments in collection or treatment facilities, and the effect upon members of Metropolitan Denver Sewage Disposal District No. 1 as compared to those who are not. Costs of administration also appear to vary, although the method of accounting for or apportioning costs by a particular agency doubtless causes some of this variation.

Thus, there are many sources of wastewater revenues, although only three appear to be significant. In addition, there are many demands for wastewater expenditures. For both revenues and expenditures, the trend is upward. Yet, revenues and expenditures mean little when separated from each other. This section, then, relates revenues to expenditures by comparing and projecting the two, and by examining which revenues are devoted to which expenditure purposes.

Sources of Funds for Specific Expenditures

In this study, a partial cash flow analysis was performed, to the extent of defining which revenues from which revenue sources are used for which expenditure purposes. Only in a few instances, however, are specific revenue sources ear-marked for specific purposes. This is because each agency maintains a general sewer or a general sewer and water fund into which is placed most revenue collected and from which come the appropriations for almost all expenditures. This co-mingling of funds renders difficult to trace the flow of funds from revenue source to expenditure item, although this is not intended as a criticism of that practice.

For bond funds, it is statutorily required that all funds derived from the sale of bonds be used only for those purposes for which the bonds were issued. As a result, bonds are nearly always issued for rather broad purposes such as plant expansion and other major categories of capital outlays. When the proceeds from a bond issue exceed the anticipated expenditure requirements for which the bonds were issued, the excess is usually devoted to pay some of the annual bond retirement costs (interest and principal). In addition, interest generated via invested bond receipts remains in the bond fund and is usually used to defray the costs of the debt.

The expense of constructing main extensions is also reasonably easy to trace to specific revenues. This is because those users for whom the extension is made are the usual direct sources of the funds to finance or recover the costs of the extension. This payment is usually required before the connection is made, particularly in the smaller agencies, and the transaction is therefore quite simple.

Other expenses incurred by the wastewater agencies (operations, maintenance, debt service and system replacement) are usually met from the sewerage system general fund. As such, revenues from a particular source are not necessarily used for a particular expense. However, the question of using specific revenues for specific expenditure purposes was posed to each agency and several generalizations were forthcoming. The results are briefly summarized on Table 25.

As depicted on this table, the costs of operation and maintenance are usually paid from general operating revenues arising from service charges and, at times, tap fees. In thirteen instances the operations are self-supporting solely from operating revenues, while three agencies (Fruitdale, Northwest Lakewood, and Pleasant View) use a tax levy to help finance operating costs. The fourth agency employing a mill levy (South Adams County) does not devote these revenues to finance operations and maintenance.

Major plant construction and expansion is nearly always financed through long-term debt. All agencies expressed eagerness to secure federal grants to assist in financing these major capital outlays. Most of the agencies, through their operating revenues (service charges and tap fees), are able to accumulate at least small sums as reserve funds which, if sufficiently large, are appropriated to meet capital improvement needs. This is particularly true for less-than-major capital needs.

All of the sampled agencies report devoting current operating revenues to regularly pay for the costs of system replacement. There appears to be no use of bond funds to finance system replacement or deferred maintenance.

It must be noted here, that several agencies (Westminster, Pleasant View) maintain records which do not separate water and wastewater accounts. Sewer tap fee revenues and sewer service charge revenues are readily distinguishable from the water receipts, as are bond funds, but other sources of revenue and many of the expenditure items are not neatly divisible from the accounting records. Frequently the accounting system reflects the organization for work; e.g., the same work crews might maintain both water and sewer mains. As a result, it becomes difficult to trace precisely the flow of funds within these agencies. Adequate cash flow analysis could be accomplished by means of an audit, but such a task is well beyond the scope of this study.

Table 25
SOURCES OF FUNDS FOR VARIOUS SEWERAGE PURPOSES
Selected Municipalities and Sewerage and Sanitation Districts
Denver SMSA
1972

JURISDICTION Municipalities	OPERATIONS AND MAINTENANCE	MAIN EXTENSIONS	NEW PLANT CONSTRUCTION	DEBT SERVICE	SYSTEM REPLACEMENT
Arvada	Primarily service charges: self-supporting.	Developer does all work and pays all costs; lines turned over to municipality; if city does the work, owners reimburse city on a front footage basis.	Revenue bonds for major work; service charges and tap fees for minor expansions.	Service charges and tap and permit fees.	Primarily service charges.
Boulder	Service charges and tap fees: self-supporting.	Special assessment if new district is formed; developer pays total cost if no district; city pays for oversizing with most money coming from plant investment fees.	Revenue bonds, federal grants, and operating funds (service charges, tap fees, and plant investment fees).	General revenue (service charges and tap fees).	General revenue (primarily tap fees and service charges).
Broomfield	Service charges: self-supporting.	Developer either builds extension, or city does it and developer pays for it via a reimbursement agreement.	Revenue bonds and service charges.	Primarily service charges.	Primarily service charges and tap fees.
Denver	Service charges: self-supporting.	Developer will pay; mains already exist in nearly all of the city; vertical growth requires oversizing of mains.	Service charges as much as possible; General obligation bonds when necessary.	Mill levy of the city, but paid out of sewer funds.	Service charges.
Englewood	Service charges: self-supporting.	Developer does the work and pays for the extension, city will then take it over and provide the service.	Service charges, tap fees, bonds, and federal grants.	Service charges and tap fees.	Service charges and tap fees.
Littleton	Service charges and tap fees: self-supporting.	Developer does the work and pays for the mains; alternative is to form a special improvement district.	Bonds, federal funds, and/or tap fees.	Service charges and tap fees.	Service charges and tap fees.
Longmont	Service charges and tap fees: self-supporting.	Developer puts mains in himself; if oversize city pays difference from general revenue (service charges and tap fees).	Bonds and general revenues (service charges and tap fees).	Raise service charge and tap fees to cover debt.	General revenue (service charges and tap fees).
Thornton	Service charges and tap fees: self-supporting.	Developer reimburses city; city front-ended recent extension but anticipates recovering all costs from developers through tap fees.	Revenue bonds.	Tap fees.	Service charges and tap fees.

Table 25
SOURCES OF FUNDS FOR VARIOUS SEWERAGE PURPOSES
(Continued)

JURISDICTION	OPERATIONS AND MAINTENANCE	MAIN EXTENSIONS	NEW PLANT CONSTRUCTION	DEBT SERVICE	SYSTEM REPLACEMENT
Municipalities					
Westminster	Service charges [illegible] self-supporting.	Subdivider does work and pays; city pays for oversizing and is reimbursed via a recovery contract paid by tap fees.	Bonds plus tap fees.	[illegible] and tap fees.	General revenue (service charges and tap fees).
Districts					
MDSD #1	Operating revenues (service charges).	Bonds if to an existing member; individually negotiated contract if a new member.	Bonds only.	Service charges.	Service charges.
Brighton	Operating revenue (primarily service charges); self-supporting.	Developer puts in and pays for extensions; City pays oversizing out of operating revenues.	Bonds, federal funds, operating revenues.	Plant investment fee and general revenues.	General revenue (service charges and tap fees)
Fruitdale	General fund (mill levy, service charges, and tap fees); self-supporting.	Developer normally makes the extension, district then takes it over. Few new extensions anticipated.	Mill levy and savings, although no plant expansion is anticipated.	Mill levy and general revenue, although no debt now outstanding.	General fund (tap fees, service charges, and mill levy).
Lafayette	Operating revenue (tap fees and service charges); self-supporting.	Developer builds line and pays for it, deeds over to city; if city builds line - bonds are used and paid back via tap charge; oversizing city would pay (haven't done it to date).	Bonds, and currently applying for federal funds.	General operating revenue (tap fees and service charges).	Operating revenue (tap fees and service charges).
N.W. Lakewood	Primarily mill levy, with some general revenues.	Developer does the work and pays; district then takes over the mains.	Mill levy or bonds.	Mill levy and tap charges.	Mill levy and general revenues.
Pleasant View	General fund (mill levy and service charges).	Developer usually pays total cost, although mill levy used at times when extension isn't to a specific development.	Mill levy, bonds, but no expansion anticipated.	Mill levy and operating revenues.	General fund (mill levy and service charges).
South Adams	Service charges and tap fees; (not mill levy); self-supporting.	Developer pays - District builds; developer is required to pay costs before service starts; District would pay for oversizing from operating levies (service charges and tap fees).	Bonds, federal aid.	Mill levy only. Prior years used some operating revenues.	Service charges and tap fees.

Uses of Operating Funds

Operating revenues, consisting of those monies generated by means of the service charge, tap fee, and mill levy, are used, at least at times, to cover almost all expenses incurred on the part of the wastewater agency. The general policies of the agencies seem to be to cover all operating costs (operations, maintenance, general fund, collection, and treatment) with operating revenues, and accumulate surplus operating revenues as a reserve for debt retirement or to defray the costs of capital expansion and improvement. There appears to be little regulation of operating funds except to limit their use to within the wastewater agency or to transfers to the general fund to cover the costs of wastewater administration, billing, accounting or other support services.

Table 26 depicts operating revenues and operating expenditures for each of the sampled agencies for 1970. Also shown are the operating revenues divided by the operating costs. As shown, in every case in 1970 there occurred an excess of operating revenues over operating costs. Each agency retires its debt out of operating revenues, and also, wisely, utilizes the operating revenues to finance certain capital expenditures. The amount of excess revenue, after operating costs are paid, varies substantially for the sampled agencies. For example, the City and County of Denver has a very small margin, with operating revenues being 102 percent of operating costs. However, the Denver Wastewater Division does not use its funds to retire debt (Denver's debt is general obligation bonds payable from property tax revenues), and does not require debt service reserves. On the other hand, South Adams County has a sizeable "surplus." However, South Adams County in 1970 had a sizeable debt retirement obligation (bonds to be paid off in 1973), and also had relatively large capital improvement needs relative to total expenditures. Consequently, this agency needs a large reserve to meet these requirements. Skillful employment of excess revenues can effectively "shave" peak revenue requirements and avoid rate increases or fluccuations.

Hence, each agency is able to currently meet its operating costs with operating revenues. In addition, each jurisdiction maintains a rate structure (service charge, tap fees, tax levy) which allows it to derive current operating revenues sufficient to provide for bond retirement and defray at least part of the costs of recurring capital improvement needs. Several instances were noted where tap or connection charges provided a substantial portion of the revenues needed for operating and maintenance expense. It is presumed that service charges will be adjusted in the future so that operating revenue requirements will be less dependent on continued growth.

Table 26
OPERATING COST/REVENUE ANALYSIS[a]
Selected Municipalities and Sanitation Districts
Denver SMSA
1970

AGENCY	CURRENT OPERATING REVENUES	CURRENT OPERATING COSTS	OPERATING REVENUES DIVIDED BY OPERATING COSTS
Municipalities			
Arvada	$ 494,991	$ 327,108	1.51
Boulder	1,214,344	475,070	2.56
Broomfield	68,000	38,747	1.75
Denver	5,547,886	5,437,547	1.02
Englewood	339,827	192,862	1.76
Littleton	208,381	82,773	2.52
Longmont	272,404	199,242	1.37
Thornton	707,472	525,493	1.35
Westminster	288,854	211,305	1.37
Districts			
MDSDD #1 (1971)	$4,978,765	$3,018,196	1.64
Brighton	$ 114,328	$ 37,982	3.01
Fruitdale	77,000	N.A.	N.A.
Lafayette	49,669	39,692	1.25
Northwest Lakewood(1971)	232,707	147,397	1.58
Pleasant View	77,486	N.A.	N.A.
South Adams	288,750	90,860	3.18

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[a] Operating Revenues: service charges, tap fees, mill levies; excludes interest and miscellaneous revenues.
Operating Costs : operations, maintenance, transfers to general fund, treatment, and collection costs.

Uses of Capital Funds

As indicated, at least limited capital funds can usually be generated from current operating revenues. If excesses of revenue over expenditures accumulate at the end of the fiscal year, these are typically placed in a capital reserve account, to be used as the need dictates. When monies accumulated in the account are insufficient to meet immediate capital improvement needs, debt is incurred to make up the difference. In a few cases, funds may be transferred from the municipality's general fund for these purposes, but reportedly this procedure is not often used.

The capital reserve account, in conjunction with long-term debt issued for capital investment purposes, is used for such major items as plant expansion and improvement, main construction, improvements to meet federal standards, and so on. In addition, the capital reserve accounts can be used for annually recurring capital needs, and for system replacement and upgrading.

As noted previously, the monies generated via debt incurrence are legally used only for those purposes described in the bond issue. The reserve account, on the other hand, can be used for almost any wastewater purpose. For example, if operating costs are abnormally high for one year or contingencies encountered, the money accumulated in the reserve account could be used to cover it. Thus, the capital reserve account in practice may function much like a contingency fund, to be used wherever and whenever needed. Most municipalities, by ordinance, place some restrictions on their capital reserve funds, as do the restrictive covenants in certain of the district revenue bond issues.

Revenue and Expenditure Trend Analysis

Generalizations regarding revenue and expenditure trends and implications are, on the surface, quite difficult to generate. Upon more detailed analysis, however, it was found that the problems confronting the sampled agencies are quite similar. The larger agencies tend to have adequate professional staffs to analyze and project costs and revenues, whereas the smaller agencies cannot on a continuing basis. For example, few of the smaller agencies forecast future revenues and expenditures on a detailed basis. They know their future schedule of debt service and, by means of capital improvement programming, may establish some schedule of future capital requirements. However, projections of operational costs and revenues are usually not well established, so the demands upon revenue sources are not well defined. Agencies typically anticipate that periodic rate increases will meet all costs of operations, and that periodic bond issues will meet capital costs not financed by federal grant. In other words, few of the agencies have a well formulated financial program regarding wastewater systems.

The financial trends and problems can be illustrated by means of an example. The City of Longmont has forecasted its various revenue sources and the demands to be placed on these revenues. What is found in the examination of this forecast is similar to that of most of the other sampled agencies.

Table 27 summarizes the historic (1967-1972) and projected (1973-1976) revenues and costs of the City of Longmont sewerage system. The service charge revenues are anticipated to increase continuously as a result of community growth. In addition, it is forecast that a service charge increase from 27 percent to 40 percent of the water bill will have to be implemented as of January 1, 1973. One reason that the service charge increase is necessary is that, while water rates increased steadily during the period, each increase in water rate had a corresponding decrease in sewer rate as a percent of the water bill. The net result was a decreasing percentage of an increasing water bill so that the sewer service charge,and wastewater revenues, remained constant between 1967 and 1972.

The connection (tap) fee revenues also are seen to be increasing. This also is the result of growth, plus an increase in tap fee from $150 to $200 in 1972. A larger than normal increase in tap fee revenue in 1971 and 1972 is the result of a large mobile home park constructed and connected to the system during those years. In 1973, the connection fee revenues are shown to be back to the pre-1971 trend. Interest and other revenue are shown to be relatively stable.

Longmont's expenditure patterns are also seen to be increasing between 1967 and 1976. Total operating costs are seen to entail an increase of 293.5 percent between 1967 and 1973. Of this amount, the cost of administration entails the largest increase, although this increase is not accurately illustrated by the statistics reported on Table 27. This is because of a change in accounting procedures between 1971 and 1972, and the reallocation of costs resulted in a substantial decrease in recognized administrative costs but an increase in disposal and

Table 27
REVENUE/EXPENDITURE TRENDS AND COMPARISONS
An Example - City of Longmont
1967 - 1976

REVENUE	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Service Charges	$121,326	$141,684	$153,536	$183,819	$207,299	$221,486	$411,600	$445,000	$481,000	$519,000
Tap Fee and Line Charges	50,019	58,823	68,001	89,735	166,391	190,482	158,000	171,000	185,000	200,000
Interest	2,338	2,200	1,808	669	182	-0-	1,000	1,000	1,000	1,000
Other Revenue	1,188	274	2,136	3,092	1,566	11,442	4,000	4,000	4,000	4,000
TOTAL REVENUE	$174,871	$202,981	$225,481	$277,315	$375,438	$423,410	$574,600	$621,000	$671,000	$724,000
EXPENSES										
OPERATING:										
Administration	$ 36,530	$ 27,520	$ 68,827	$ 81,706	$128,185	$ 34,573	$ 48,437	$ 53,400	$ 58,700	$ 64,600
Disposal Plant	38,812	49,230	17,890	32,751	33,141	91,961	116,654	128,300	141,100	155,200
Repair and Maintenance	10,152	17,407	14,224	14,335	13,898	38,282	108,634	119,500	131,500	144,700
Garbage Collection	9,600	9,600	9,600	9,600	9,600	9,600	9,600	10,000	10,000	10,000
Lift Station Expense	193	2	340	450	564	1,000	2,000	2,000	2,000	2,000
Irrigation Expense	404	214	-0-	-0-	137	-0-	-0-	-0-	-0-	-0-
TOTAL OPERATING EXPENSE	$ 95,691	$103,973	$110,881	$138,842	$185,525	$175,416	$285,325	$313,200	$343,300	$376,500
NON-OPERATING:										
Transfer to General Fund	$ 10,020	$ 15,000	$ 20,000	$ 70,000	$ 25,000	$ 30,000	$ 57,460	$ 62,100	$ 67,100	$ 72,400
Transfer for Debt Retirement	38,400	38,400	53,400	85,600	95,600	86,200	86,200	86,200	86,200	75,000
TOTAL NON-OPERATING	$ 48,420	$ 53,400	$ 73,400	$155,600	$120,600	$116,200	$143,660	$148,300	$153,300	$147,400
CAPITAL	42,808	87,887	(67,950)	29,070	48,778	54,122	137,625	517,400	120,400	90,500
TOTAL EXPENSES	$186,919	$245,260	$116,331	$323,512	$354,903	$345,738	$566,610	$978,900	$617,000	$614,400
NET CHANGE IN FUNDS	$(12,048)	$(42,279)	$109,150	$(46,197)	$ 20,535	$ 77,672	$ 7,990	$(357,900)	$ 54,000	$109,600
Adjustment					(42,453)					
OPERATING FUNDS AVAILABLE	$ 46,637	$ 4,358	$113,508	$ 67,311	$ 45,393	$123,065	$131,055	$(226,845)	$(172,845)	$(63,245)

repair and maintenance expenses. Under operating expenses, two costs are included which are not normally wastewater costs: garbage collection and irrigation expense. Both of these are included herein because they are reported as sewage costs in Longmont's reporting procedures. These costs are minor and therefore do not significantly change the trend, but point out the problems encountered due to the lack of a uniform system of accounts.

A generally increasing trend in transfers to the general fund is also noticed. This, as indicated earlier, is to cover the costs of billing and accounting and some overhead (administrative) costs. As the use of debt increases (new issue in 1969 - 1970), the cost of debt also increases. In addition, it is common practice to schedule principal and interest payments (bond retirement) in such a manner as to spread the costs among more users as the number of users of the sewer system continue to increase.

Capital outlay costs also tend to increase, although the annual capital costs vary considerably because of the non-recurring costs included in this category. It should be noted that the capital expenditure in 1969, in parentheses, is the year that the city booked plant and inventory for the first time; further, that the large capital outlay programmed for 1974 is for a new digester, new trickling filter, and other smaller capital items.

The historic and projected revenues and expenditures, however, are most important when compared with each other. This comparison is indicated by the Net Change in Funds. As shown, there is a year-end deficit for half the years and a year-end surplus for the other years. The revenue trend for these years remains quite constant, so the reason for the fluctuating deficit/surplus is the fluctuating expenditure pattern. The net change in funds, as of the end of the year, plus or minus the previous year's surplus/deficit, is depicted as "Operating Funds Available." The monies in this row are what is to be carried over to the next year.

This rather detailed example is quite typical of all of the sampled agencies. It shows several things worthy of note:

1. It is deemed necessary to raise tap fees and service charge rates from time to time so as to cover increasing construction and operating costs;

2. Reliance on tap fees and,to some degree, service charges is in turn a reliance on the continued growth and expansion of sewer service and users;

3. Accounting procedures vary from agency to agency;

4. Large capital expenditures, often for plant expansion, are required from time to time;

5. Operating revenue "surpluses" are not sufficient to pay for these large capital expenditures. As a result, long-term debt is requisite for plant expansion.

6. Deficits accumulate quite often and only rate increases or additional debt can meet system needs at times;

7. Inflation is causing many of the cost increases;

8. It is readily forecast that debt will have to be issued so as to negate projected total system deficits;

9. There has not been an attempt to regulate growth via increased tap fees, although this is an apparent possibility;

10. Repair and maintenance and treatment plant costs are rising rapidly even when the changes in accounting practices are excluded.

FINANCIAL MANAGEMENT PRACTICES

The management of wastewater funds is generally similar in all of the agencies studied. The most important fiscal practices, with emphasis given to those which deal with financial planning and control, are described below.

Budgeting, Auditing, and Accounting Practices

An extremely important financial planning tool, which every agency must formulate, is the annual budget. The Colorado Revised Statutes prescribe that every unit of local government prepare and adopt an annual budget for the ensuing fiscal year. It must set forth all proposed expenditures, show any deficits from prior years, and indicate all anticipated revenues for that upcoming fiscal year. All of the sampled agencies comply with the basic requirement, and it was possible to analyze the budgets of most of these agencies in the course of this study.

The sanitation districts formulate budgets which usually separate water and sewer revenues and expenses. However, two of the sampled districts combine their water and sewer financial records. Municipalities prepare city-wide budgets, with appropriations and revenues for the wastewater department being only one part. In the typical municipal budget, the appropriations and expenditures for each department are separated, with revenue-producing departments usually being further separated into self-sustaining "funds." Some budgets include a balance sheet which indicates assets and liabilities, an income statement, and detailed tables of anticipated revenues and expenditures. Some agencies are moving toward a "program" or "performance" budget.

Certain budgetary considerations, and problems, are worthy of note here. The budget is the principal policy and management tool available to the local unit of government. While each department or agency head would normally prepare the budget request, the ultimate decision by the governing body must accomplish a balance of needs and goals with available resources.

The manager or finance officer of the agency submit balanced budgets for all activities and programs recommended. However, the final budget represents priorities and policies of the organization as established by the governing body. There may occur instances in which excessive requests are used as a bargaining device to obtain desired fund allocations. However, the budgets reviewed appeared to be based on realistic expectations, and incorporating some balance between competing demands, and between needs and public acceptability of rate and charge levels to be levied.

The budget should be sufficiently flexible to allow for unusual or unanticipated circumstances. Some of the budgets provided no appropriation for contingencies or insurance. Budget procedures sometimes tend to hide inefficiencies by continuing initial expenditures in succeeding periods without proper evaluation. Consequently, frequent reexamination of the various allocations is needed so that precedence and trend should not become the sole tools used for budget preparation and review. The format of budgets can, over time, become so complete and detailed that the budgets become burdensome, expensive, and even meaningless. Finally, budgets are tools, not ends in themselves. Therefore, budget execution, and appropriate accounting therefor, become equally important to budget preparation and adoption.

A second financial requirement of every unit of local government is the annual external audit. This audit, prepared by an independent outside agency or individual, depicts all financial affairs and transactions of the agency and is set forth as public record. A copy of the annual audit is sent to the State Auditor for his review. Each audit is made in accordance with generally accepted accounting practices, with a series of tests utilized to judge the records of each agency. Many of the audits for the sampled agencies were reviewed in this study, and appropriate information is used in various parts of this report. Unfortunately, the annual audit is too frequently a certification of the accuracy of the records, rather than a document which points to improvement of financial policies and practices.

A third financial tool, as set forth in the Colorado Revised Statutes, is a uniform classification of accounts. The State Auditor formulates, prescribes, and publishes a system of accounts which is to be uniform for every level of government. Review of the audits, budgets, and other financial statements indicates that there is some uniformity of accounting practices and classification systems on the part of wastewater agencies. However, there is sufficient flexibility that all account classifications are not necessarily uniform. This has made the comparisons of expenditures and revenues rather difficult. This, however, should not be necessarily a criterion: the primary purpose of an accounting system is to produce useful management information for the agency, not necessarily to facilitate comparisons.

In addition to budgets, audits, and uniform accounting procedures, each local governmental agency is required to maintain an internal system of records of all expenditures, revenues and transfers of money between funds, so that internal audit and analysis of financial affairs can be performed at any time within the fiscal year.

Billing and Collecting

Each municipality and district has adopted prescribed methods of billing for sewer tap fees and service charges. Billing procedures are generally uniform among the agencies, although the billing frequencies for service charges vary considerably. The tap fee billing period and the frequency of service charge billing are shown on Table 28. As depicted, most agencies levying a tap charge require the payment to be made before the tap is physically made. Only three agencies permit a tap to be made with the fee deferred to a later date. This deferral is infrequently permitted and only in severe hardship cases.

Sewer service charges by the agencies vary in their frequency of billing. Most agencies appear to favor billing on a monthly basis, while three bill bi-monthly and several bill quarterly. Northwest Lakewood collects a service charge semi-annually, but this is not a service charge per se, but is rather the mill levy which is used in lieu of a service charge. Three agencies also bill special users annually. It appears that all agencies bill their water and wastewater users jointly whenever both services are supplied. In all cases, however, the joint billing separates the sewer service charge from the water charge although both are contained on the same bill.

In the event a user does not pay his sewer service charge, the statutes authorize the municipality to disconnect service to users located outside of the city limits. If the user is located inside the city, the municipality may not disconnect service but can place a lien on the property to be payable as if it were a property tax. This is the action taken by most of the sampled agencies when users become delinquent in payment of service charges.

Table 28
WASTEWATER BILLING PROCEDURES
Selected Municipalities and Sanitation Districts
Denver SMSA
1972

JURISDICTION	CONNECTION (TAP) FEE BILLING		SERVICE CHARGE BILLING					JOINT BILLING
Municipalities	Prior to Tap	Deferral Possible	Monthly	Bi-Monthly	Quarterly	Semi-Annually	Annually	Sewer and Water
Arvada	X	X		X			X (a)	X
Boulder	X		X					X
Broomfield	X	X		X				X
Denver	None			X				
Englewood	X	X			X(b)		X(c)	X
Littleton	X				X			
Longmont	X		X					X
Thornton	X		X					X
Westminster	X		X					X
Districts								
MDSDD #1	Negotiated				X			
Brighton	X				X			X
Fruitdale	X				X(e)	X(f)		
Lafayette	X		X					X
N.W. Lakewood	X					X(d)	X(e)	X
Pleasant View	X				X			X
South Adams	X		X					X

(a) For those without water accounts.
(b) If inside City.
(c) If outside City.
(d) Mill levy.
(e) Commercial only.
(f) Residential only.

SOURCE: Contacts with district and municipal officials.

Capital Improvement Programming

The programming of capital investments is a separate but yet related element in the annual budgeting procedure and the act of financial planning. While operating budgets are prepared for one year in the future, capital improvement programming looks several years into the future. In the case of the sampled agencies, the capital improvement programs typically covered a period of five or six years into the future. Hence, a program developed in 1972 would generally indicate those capital needs to be required through 1977 or 1978.

Where the annual budget process reviewed, in detail, all costs and revenues for the forthcoming year, the capital improvement program reviews only one form of expenditure: capital outlays. The capital program should, but in practice does not necessarily consider anticipated sources of revenues, although cost estimates are prepared for each capital item. Operating costs resulting from capital outlays are less-frequently estimated, and staging of outlays (land purchase, design, construction, etc.) is frequently ignored.

A capital improvement program is very essential to the well-being of the wastewater agency. The capital improvement is a long-term investment, with long physical and economic life, and it is a number of years before the results of the investment are fully realized. The decision maker, once the funds are committed, is a hostage to future events. Consequently, the preparation, adoption and periodic updating of the capital improvement plan cannot be taken lightly. The need for most capital investments is predicated on the forecasted need for the facility, with that forecast entailing projected community or district growth, anticipated wastewater volumes, and the useful life or adequacy of existing facilities. Consequently, an adequate projection of needs is requisite to the capital improvement plan. For example, over-investment in assets can create undue, and sometimes unacceptable, long-term costs; under-investment might result in failure to meet needs on a timely basis resulting in undercapacity or unnecessary repair and maintenance.

Capital needs expressed in the capital improvement program are generally quite large. As such, considerable investigation and planning, and consideration of alternatives, must precede the commitment to expenditures. The timing for funding such expenditures is also important. The climate for bond approval or for satisfactory bond sale, varies over time, and it is usually possible to make a large capital improvement in any of a number of years. With adequate programming, the agency can avoid situations where plant expansion or other needs are required immediately. Suddenly-needed items almost invariably entail greater costs than planned, scheduled outlays. Finally, a variety of capital needs is always present. If sufficient, long-range planning is made, it is usually possible to rank and phase the needs according to a realistic priority schedule. The wastewater agency must be an active participant in all planning affecting its service; typically it possesses little or no control over the extent or pace of growth.

Most of the sampled agencies recognize the need for capital improvement programming, those which anticipate capital needs have some form of capital improvement plan. An example of a capital improvement program is shown on Table 29. This example is for the City of Longmont wastewater department, and depicts the detail in which a good plan is programmed. By means of this plan, Longmont is able to forecast its financial needs and is able to anticipate its cash flow and future revenue needs.

The projected needs and revenues will indicate if increased revenues from rates and charges will be required, and what bond issues should be anticipated. The results of this capital improvement program can then be incorporated into the projection of revenues and costs, as previously shown on Table 27.

Metropolitan Denver Sewage Disposal District No. 1, as part of its 1973 annual budget, has prepared a detailed statement and 5-year projections of revenues and expenditures for each of its four Funds: Operations and Maintenance; Acquisition and Construction; Debt Service; and General Reserve. Table 30 and Table 31, taken from that budget, depict sources of funds and expenditure summaries for the Operations and Maintenance Fund and the Acquisition and Construction Fund, respectively.

In addition to these summaries, the budget contains detailed documentation of estimates by each expenditure object or function, for each of the MDSDD #1 activities and programs. This provides an extremely comprehensive grasp of costs and revenues anticipated, and basis for allocation of actual costs subsequently incurred.

The budget message, prepared by the Manager and his staff, points up significant features or changes in anticipated outlays, describes their causes and what measures are proposed. For example, the 1973 message takes note of sharply

Table 29
A TYPICAL CAPITAL IMPROVEMENT PROGRAM
City of Longmont Sewer Department
1973 - 1977

NAME AND LOCATION	YEAR IN WHICH CONTRACTED				
	1973	1974	1975	1976	1977 & after
Trickling filter	$ -0-	$150,000.00	$ -0-	$ -0-	$ -0-
New digester	-0-	200,000.00	-0-	-0-	-0-
Build new manholes	1,500.00	1,500.00	1,500.00	1,500.00	1,500.00
Main Replacement					
No. to 9th Avenue on Bowen		10,000	-0-	-0-	-0-
Alta & Pratt, 9th to 11th	-0-	-0-	18,000.00	-0-	-0-
Alley west of Judson, 7th to 3rd	-0-	-0-	-0-	10,000.00	-0-
Bross, 8th to 11th,	-0-	-0-	-0-	-0-	12,000.00
Alley west of Francis, 7th to 6th	-0-	-0-	6,000.00	-0-	-0-
Sludge Circulating pumps	20,000.00	20,000.00	-0-	-0-	-0-
Return sludge pump	1,800.00	-0-	-0-	1,800.00	-0-
Move grit chamber and grinder	-0-	-0-	20,000.00	-0-	-0-
New pipe to gas burner	1,200.00	-0-	-0-	-0-	-0-
Sensor controls for lift stations	2,000.00	-0-	-0-	-0-	-0-
Customer services	9,000.00	9,900.00	10,900.00	12,800.00	14,000.00
Equipment (Replacement & New)	29,150.00	66,000.00	4,000.00	4,400.00	4,800.00
Oversize and Main Improvements	60,000.00	60,000.00	60,000.00	60,000.00	90,000.00
TOTAL	$124,650	$517,400.00	$120,400.00	$90,500.00	$122,300.00

increased costs of hauling sludge cake as the cause of increases in sludge processing expenditures for 1973, but that proposed plant expansion (Table 31) and transmission of liquid sludge by pipeline for soil conditioning will reduce costs substantially, as reflected in sludge processing costs after 1974 (Table 30).

The comprehensive planning which has gone into the preparation of the 1973 Budget and 1973-1977 Program Summary is a credit to MDSDD #1, and should be an example to, as well as facilitate the physical and financial planning by member agencies as well as other wastewater agencies within the Denver SMSA.

Table 30
OPERATIONS AND MAINTENANCE FUND
SOURCE OF FUNDS AND PROPOSED EXPENDITURES
Metropolitan Denver Sewage Disposal District No. 1

	1971 Actual	1972 Current Estimate	1973 Budget Estimate	1974 Program Estimate	1975 Program Estimate	1976 Program Estimate	1977 Program Estimate
Operations and Maintenance Fund							
Balance, January 1	$1,266,039	$1,617,150	$1,844,573	$2,012,355	$2,012,355	$2,012,355	$2,012,355
Annual Charges	4,978,765	5,283,276	5,774,452	5,783,134	6,057,498	6,039,640	6,444,066
Interest Income	192,716	165,000	167,700	188,400	186,600	187,200	191,800
Other Income	2,277	500	0	0	5,000	5,000	5,000
Transfer from General Reserve Fund	25,000	0	0	0	0	0	0
Gross Revenue	5,198,758	5,448,776	5,942,152	5,971,534	6,249,098	6,231,840	6,640,866
Less Transfer to Other Funds							
Debt Service Fund	1,343,970	1,381,020	1,416,720	1,461,070	2,248,770	2,288,670	2,524,158
Acquisition and Construction Fund (Platte River II Project)	238,077	170,757	173,502	177,112	258,089	0	0
General Reserve Fund	238,077	170,756	173,501	177,112	258,089	282,630	276,108
Total Transfer Amount	1,820,124	1,722,533	1,763,723	1,815,294	2,764,948	2,571,300	2,800,266
Total Funds Available for Operations and Maintenance	4,644,673	5,343,393	6,023,002	6,168,595	5,496,505	5,672,895	5,852,955
Less Expenditures							
Wastewater Transmission	72,112	100,010	89,940	100,400	114,080	122,530	129,760
Wastewater Treatment	686,655	789,830	846,800	889,860	1,364,810	1,438,720	1,511,980
Sludge Processing	1,499,728	1,677,020	1,952,700	2,100,740	697,430	712,480	747,410
General and Administrative	759,701	915,740	983,680	1,041,740	1,284,280	1,356,170	1,434,430
Capital Outlay		16,220	44,560	23,500	23,550	30,640	17,020
Total Expenditures	3,018,196	3,498,820	3,917,680	4,156,240	3,484,150	3,660,540	3,840,600
Less Provision for O & M Contingencies			92,967				
Adjustment to Prior Year Annual Charges	(6,100)						
Change in Reserve for Authorized Expend.	(3,227)						
Operations and Maintenance Fund							
Balance, December 31	$1,617,150	$1,844,573	$2,012,355	$2,012,355	$2,012,355	$2,012,355	$2,012,355
O & M Reserve	610,895	838,318	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
O & M Working Capital	1,006,255	1,006,255	1,012,355	1,012,355	1,012,355	1,012,355	1,012,355

SOURCE: MDSDD #1 1973 Budget.

Table 31
ACQUISITION AND CONSTRUCTION FUND
SOURCE OF FUNDS AND PROPOSED EXPENDITURES
Metropolitan Denver Sewage Disposal District No. 1

Source of Funds	1971 Actual	1972 Current Estimate	1973 Budget Estimate	1974 Program Estimate	1975 Program Estimate	1976 Program Estimate	1977 Program Estimate
Acquisition and Construction Fund Balance, January 1	$1,552,781	$1,222,433	$1,060,070	$8,078,572	$2,439,194	$2,429,093	$4,734,743
Transfer from O & M Fund	238,077	170,757	173,502	177,112	258,089		
Transfer from General Reserve Fund				200,000	200,000	200,000	200,000
Federal Grants in Aid of Construction	242,131	663,600	7,445,500	17,447,500	4,826,500	7,102,200	4,955,300
State Grants in Aid of Construction		129,400	1,063,600	1,500,000	1,500,000	1,196,600	707,900
Proceeds of 1973 Bonds			10,635,000				
Proceeds of 1977 Bonds							3,000,000
Interest Income	121,131	50,000	360,000	180,000	120,000	120,000	120,000
Miscellaneous Income	6,921						
Release of Res. of Author. Expend.		469,374					
Total Funds Available	2,161,041	2,705,564	20,737,672	27,583,184	9,343,783	11,047,893	13,717,943
Less Proposed Expenditures							
Wastewater Transmission Facilities	312,565	941,048	2,726,000	2,875,000	3,215,000	2,501,300	5,174,000
Metro Plant Expansion	123,628	574,446	9,928,100	21,973,990	77,690	13,850	5,530
Satellite Plants			5,000	295,000	3,622,000	3,798,000	6,410,000
Total Proposed Expenditures	436,193	1,515,494	12,659,100	25,143,990	6,914,690	6,313,150	11,589,530
Change in Reserve for Authorized Expend.	(502,415)						
Reserve for Burlington Ditch Pumping Station		(130,000)					
Acquisition and Construction Fund Balance, December 31	$1,222,433	$1,060,070	$8,078,572	$2,439,194	$2,429,093	$4,734,743	$2,128,413

SOURCE: MDSDD #1 1973 Budget.

Section V

ALTERNATIVE FINANCIAL ARRANGEMENTS

The Colorado Statutes provide for and authorize a wide range of financial measures for the support of sewerage system construction, operation and maintenance.

Tap Charge

The tap charge is the most common form of charge or levy. It is a one-time cash charge, levied as a pre-requisite to initial sewer service. Beyond that, there is considerable variation in practice within the Denver SMSA as to the particular type, amount and purpose of the charge. In some instances the charge is termed an "inclusion"fee, which is in effect an initial assessment of allocated investment costs for inclusion in the group of users of the sewerage system. In other instances it is a "connection" charge, designed only to cover the actual cost of the physical connection between the sewer main and the property of the user. In still other instances the tap charge is designed to cover the alloted cost of the service main, based either on property frontage or some otherwise-devised proportionate share. Finally, the tap charge is sometimes utilized as a "plant investment" fee, designed to cover the cost of a present or future unit of capacity of one or more components of the sewerage system. In actual practice, the tap charge may occur as general revenues to the system, may have been pledged revenues under bond covenants, may have been established to cover any one or more of the cost factors described, may not have been revised as cost factors changed, and may reach a substantial dollar amount. The use of tap charges is authorized for any wastewater agency operating a collection system, and generally constitute a lien upon the property until paid. This latter provision is somewhat unique to Colorado.

Special Assessment

The special assessment, for specific system improvements, is designed to recover all or a part of the costs of system extensions or improvements which are of special benefit to a particular group of users. The Statutes provide legal procedures by which notice is published and public hearing conducted on the nature, scope and financial implications of the improvement, both prior to the ordering of the improvement and prior to the levy of the assessment. Assessments may be levied on an actual cost, property frontage or area, property valuation enhancement, or other selected bases of benefit, and until paid constitute a perpetual lien on the property of the beneficiary. Assessments may be levied only upon property within the jurisdictional boundaries of the agency. While the assessment procedure may create, in specific instances, the same effect as the tap charge, it has two important distinctions. The first is that the cost of the improvements are spread and levied upon all benefitting properties, inhabited or uninhabited, simultaneously, and with provision for time payments. The second is that the wastewater agency may create special improvement districts in which special assessments might be levied for improvements other than service mains which are of special benefit to the properties. In both instances, however, the wastewater agency initially finances the improvements. Assessment collections may be lawfully applied only to the costs of the improvements and are not general revenues.

Service Charge

The service charge is designed to finance the annual operating costs of the system, such as administration, maintenance and repair, collection, treatment and disposal operations and, usually, debt service. Some agencies provide further that the service charge cover the cost of annually-recurring capital improvements, which may include system extensions. The service charge, basically, is a cost-of-service charge, designed to produce continuing general revenue to meet continuing system operating costs.

The service charge, sometimes called "sewer rent," is almost invariably based upon some measure of use or demand upon the system. We therefore find charges based upon the number of connections or fixtures, units of area or number of occupants, or a portion of the water charges if the water use is metered. The Statutes further provide that the derivation of charges "may give weight to the characteristics of sewerage," and a number of agencies accordingly provide a charge for non-domestic wastes based upon those measured characteristics. In some jurisdictions, the charges for BOD, SS, etc., which are levied in addition to volume charges, are called "surcharges."

Tax Levy

The Colorado Statutes permit sanitation districts to levy ad valorem taxes for wastewater purposes, for a period not to exceed five years, provided that the aggregate taxes may not exceed 3/4 mill during that period, for the initial support of the sewerage system. This enabling authority recognizes that, in early years, revenues from tap and service charges usually are not sufficient to meet debt and operating requirements, and thus require additional support to be economically self-sufficient.

Cities, towns and counties may also finance wastewater systems through property taxation, but without limitation on the rate of levy or the period of time. City and County of Denver, as a regular practice, meets debt service on general obligation bonds for wastewater system improvements from general (i.e., tax) funds, but there is no regular use of tax funds by cities and towns for the general support of their wastewater systems despite the legislative authorization.

These four basic types of revenue sources constitute the principal current revenue sources available to wastewater systems. There appear to be few reasonable alternatives available as to sources of current revenue, other than federal general or special revenue-sharing or proprietary income (investment of temporarily idle funds, sale of materials, etc.). The alternatives arise basically in the design and application of the revenue measures.

Non-current Revenue; Debt

The Colorado Statutes provide that wastewater agencies may receive grants and contributions and, under certain conditions, may dispose of real estate or other surplus property and apply the proceeds to support of the system.

The Statutes also provide for incurring indebtedness in the form of general obligation bonds, revenue bonds, bond anticipation notes or tax anticipation notes. General obligation bonds, while usually retired from system revenues, constitute a pledge of the faith and credit of, and an indebtedness against, the unit of government, and therefore require a majority vote of the electorate.

Revenue bonds are not a debt of the unit of government, but only of the wastewater system, and may,under limited conditions, be issued without referendum. Colorado state law is somewhat more stringent in this regard than that of most states. Only revenues of the system can be pledged to their retirement, (although surplus revenues of other municipal utilities may also be pledged). Consequently, interest rates are normally higher than those for general obligation bonds, and some finding of economic feasibility, plus a range of restrictive covenants on disposition of revenues, are usually required by the bond purchasers.

The Statutes provide for maximum net interest rates which are allowable, and also prescribe maximum and, in some instances, minimum maturities of the bonds. The Statutes and various court decisions generally prohibit short-term or "casual" borrowing.

Other than basic statutory provisions, very little control and supervision is exercised by the State in debt incurrence and administration. This has caused reliance by the units and agencies upon the advice of private consultants and brokerage houses. An opportunity would appear to exist for the State to perform a genuine assistance to the localities in preparing issues for sale. and in the conduct of the actual administration of the sale.

Following is a review of the basic statutes with respect to revenue measures available under the various institutional forms.

Cities

Cities are authorized to issue either general obligation or revenue bonds for the construction of sewerage facilities. However, the Statutes provide that no debt may be incurred without a vote of the people, except in the instance of bonds for water purposes. This "debt," however, refers to general obligation bonds where the full faith and credit of the city is pledged, and not to revenue bonds. Cities are also empowered to levy special assessments, such assessments to constitute a lien against the property, to cover either in whole or in part the cost of construction (other than intersections or general benefits). In the issuance of revenue bonds, cities may collect tolls, fees and charges and pledge the revenues to debt retirement. There is a maximum interest rate of 6 percent permitted and a maximum limit of 40 years on the life of the bonds. Restrictive covenants may provide for rates and charges, disposition of revenues, sinking or reserve funds, or for the pledge of surplus revenues of other municipal utilities.

The Statutes provide that all tap or service charges constitute a lien upon the property, (Colorado law on this point being more liberal than that of most states), but that service may not be disconnected for non-payment, except in the case of an outside-city user. Rates for outside service may be fixed at a differential from inside rates, with the governing body being the appeal board on rate structure.

The net indebtedness of the city government (excluding water debt) may not exceed 3 percent of assessed valuation, unless special charter provisions increase this limit. "Net indebtedness" does not include revenue bonds outstanding.

Counties

Counties may also fix and collect rates, fees and charges, issue revenue bonds and bond anticipation notes and pledge revenues to their retirement. Revenue bonds do not constitute an indebtedness of the county, may be issued at interest rates not to exceed 6 percent and at maturities of not greater than 40 years. Fees and charges also constitute a lien upon the property, and collected "as though they were a part of taxes," but service may not be disconnected for non-payment unless the user's property is outside the county. No authority was found in the general statutes for counties levying special assessments or issuing general obligation bonds for sewerage system improvements, but presumably either could be authorized by vote of the electorate, or as a provision in a county home rule charter.

Special Improvement Districts within Cities

The Colorado Revised Statutes provide that the cost of district sewers may be assessed "upon all the real estate in the district, in proportion as the area of each piece of real estate is to the area of all real estate in the district, exclusive of public highways."

Metropolitan Districts

Metropolitan Districts, which are multi-purpose districts, may levy fees, rates and charges for sewer service and, during the first five years, may certify to the County Commissioners the necessary tax levy, provided the aggregate levy does not exceed 3/4 mills for the period. This tax has been found by the courts to be a general tax rather than a special benefit tax. No statutory authority was found for levying of special assessments or for the issuance of general obligation bonds; revenue bonds are authorized under the same limitations of the statutes as apply to sanitation districts where the wastewater function is one of the multiple purposes for which the Metropolitan District is formed.

Water and Sanitation Districts

Water and sanitation districts are empowered to borrow money, incur indebtedness, levy taxes to create a debt reserve fund, and issue bonds at an interest rate not to exceed 6 percent and for maturities of not more than 20 years. Any indebtedness of greater than $5,000, or one percent of the assessed valuation, must be submitted to the electorate. Where bonds are issued for extensions of facilities into territories annexed to the district, the question shall be submitted only to the taxpayers of that territory, and taxes for repayment shall be levied only against that annexed property.

The district is also empowered to fix rates, tolls and charges and to pledge revenue therefrom to the payment of indebtedness. Until paid, such charges constitute a perpetual lien against the property. One unique provision, differing from those for other units, is that the district "shall shut off or discontinue service for delinquencies in payment." The Board of Directors is empowered and authorized to levy and collect ad valorem taxes against all taxable property within the district in an amount sufficient to meet the operating and debt requirements of the district. The actual collection is performed by the county and remitted to the district. Where the special district tax is levied against all property in a county, the board of county commissioners is authorized to make an appropriation in that amount from the general fund in lieu of levying the special tax.

Metropolitan Sewage Disposal Districts

Chapter 98, Article 15, is a very comprehensive section with respect to financial and other powers, the Act stipulating that such districts shall be a governmental subdivision of the state with such powers expressly granted and implied, necessary and proper. Many of the powers are not unique to this type of district, but certain differences do exist.

Disposal districts are empowered to borrow money, issue securities as direct and general, or special, obligations, refund bonded debt without an election, levy taxes for not more than five years in an aggregate levy not to exceed 3/4 mill, fix rates and charges to municipalities or other member agencies, pledge revenues and enforce collection by mandamus or other civil action. Municipalities are empowered to levy general ad valorem taxes, without limitation, to pay such rates and charges. Additional authority granted includes the investment of temporarily idle funds, accepting of loans and grants, providing working capital for improvements, and creating reserves for future improvements or obligations. The Act provides that revenues shall be adequate for operations and maintenance (including reserves and cost of improvements), debt service and any reserves or sinking funds therefor. One unique provision is that service charges may be collected in advance from any owner or occupant of real property which has been or will be connected or who originates waste which may or has entered the system. The Act further stipulates that charges shall be reasonable with respect to class, type and amount of use, and may give weight to such characteristics of sewage as chlorine demand, BOD, suspended solids and chemical composition.

The Act provides that no bonded indebtedness may be created without first submitting the proposition to the tax-paying electors, and provides that the district may pledge "full faith and credit" or specific revenues to debt retirement. In event of default, one of the remedies is to establish a receivership. A 40 year maximum maturity and 6 percent maximum interest for indebtedness is provided.

Regional Service Authority

Chapter 98, Article 25 (The Colorado Service Authority Act of 1972) enables an Authority to levy taxes and/or service charges, provided that tax limitations are established by the voters at the time the Authority is created. In addition, special taxing districts are authorized to be created when the services to be provided therein may vary from those provided elsewhere in the jurisdiction. Local improvement districts may also be created, and the costs of improvements assessed against those special beneficiaries in accordance with the measure of benefit. Regional service authorities may issue general obligation or revenue bonds, but the incurrence of indebtedness (general obligation bonds) must be submitted to the voters. A 30 year maximum maturity for either general obligation or revenue bonds is provided.

Budgeting and Auditing

Chapter 88 of the Colorado Revised Statutes provides certain additional controls over financial administration by local governmental units. Article 1, the Budget Law, and Article 6, the Audit Law, prescribe the preparation, general form and reporting procedures for an annual budget and audit by the various units. Adherence to a uniform system of accounting or classification of accounts, nor to a stipulated form of audit report, is not expressly prescribed. Consequently, a wide variation in budgeting, accounting and auditing practices was noted in the review made of various budgets, financial statements and audit report. With some notable exceptions, the status of local budgeting and accounting leaves a great deal to be desired. Many agencies have no procedure for allocating current costs or budgeted expenditures to functions or components of the wastewater system, and have no capital improvement program or budget for long range needs. Consequently, a great deal of cost and revenue data is simply not available.

The foregoing has been a general review of the financial powers of various institutional forms for undertaking wastewater management. It can be seen that constraints are provided by the Statutes, but primarily in the incurrence of debt and the levying of taxes for system support. With some exceptions, the inadequacies which may be noted are primarily in policy and administration rather than in statutory authority. Further, it is the scope of jurisdiction, both geographic and functional, rather than institutional form which creates major limitations in financial administration.

EVALUATION OF REVENUE MEASURES

By its very nature, the provision of wastewater collection and treatment services falls into a somewhat "gray" area, as viewed by courts and legislatures, between necessary governmental function (i.e., protection of public health and welfare) and proprietary function (operating a revenue-producing enterprise). While any distinction between the two types of functions has become muddled, the statutes and court decisions in many states still tend to treat wastewater management as a proprietary function. The distinction is important to the considerations of this study primarily because it supports the "benefit" theory of deriving revenue, and the application of "utility" principles in so doing. Yet several of the Colorado Statutes provide for the levy of ad valorem taxes throughout the jurisdiction, (thereby inducing some "ability to pay" measures), because a "general" benefit was found to result from the establishment of wastewater systems. The finding by the Colorado Supreme Court, (Gordon v. Wheatridge Water District, 1941, 107 C. 128, 109 P. 2d 899), that a tax levied on real property only was unconstitutional, gives added weight to the "ability to pay" theory, to the extent that property valuation represents that "ability" and thus is an equitable measure.

The foregoing is undoubtedly of more academic than practical consequence and concern, but is utilized to suggest that there has not been a uniform commitment to any particular theorem or philosophy. Many of the philosophical conflicts might be resolved by developing relatively simple criteria to guide governing bodies and administrative staffs in the selection, design and application of revenue policies measures. Following are some possible criteria which might be employed:

1. Are the revenue measures sufficiently productive to meet system needs and operating commitments on a certain and timely basis?

2. Is the burden distributed fairly and equitably among the various classes of users, and in accordance with the respective costs and benefits?

3. To what extent shall the system be financially self-sufficient? By what definition?

4. Are the revenue measures simple and economical in administration and enforcement?

5. Is the time period over which the cost of improvements is spread reasonable and equitable insofar as the burden upon users is concerned?

Financial Considerations

A number of financial alternatives are available to finance acquisition or extension of systems and facilities, applied either singly or in combination. These may be further categorized into measures for financing initial investments, and measures for recovering all or a part of that investment from beneficiaries of the service. In neither category is it intended to present an exhaustive list of alternative measures but rather to discuss principal features of a range of measures.

Financing of Initial Investment

The following indicate a range of alternatives of financing considerations:

General Obligation Bonds - General obligation bonds are a widely-used instrument for financing major capital expenditures and, with a favorable vote of the electorate, may be employed to finance wastewater facilities by various agencies, as noted previously. The general obligation bond is one in which the full faith and credit (taxing power) of the governmental unit is pledged to the retirement of debt. This pledge produces the lowest possible interest rate consistent with the state of the bond market and the credit standing of the issuing governmental unit. It is not necessary that the issue be retired by use of the taxing power; in most instances water and wastewater debt is retired from revenues from user rates and charges.

A continuing plan of financing under general obligation bonds is not without potential pitfalls. Primarily, this relates to questions of political feasibility, since an approving vote of the electorate is required. Whether residents in community "A" or along road "B" will vote favorably to issue bonds for a service they are already receiving, or which they might not receive under that particular program, is problematic.

Secondly, there is a danger in using the bonding power unwisely, either to finance frequently recurring capital expenditures and thus pyramid debt, or in creating a "feast or famine" climate in which the program can be implemented during the rich years yet must be curtailed during the lean. There is, after all, a practical limit to the frequency at which bond proposals can be submitted to the electorate for approval.

Revenue Bonds - Revenue bonds are backed only by the pledge of revenues from the particular system or facilities financed by those bonds. Revenue bonds thus command a higher interest rate than general obligation bonds even though the normal sources of funds for debt retirement may be the same. Revenue bonds are, generally, more politically palatable in that only those revenues derived from the users or beneficiaries are pledged toward debt repayment. Although water debt, for example, does not apply against state constitutional debt limitations, revenue bonds may be a practical answer when total debt approaches those debt limitations.

Although revenue bonds may not require the approval of the electorate, it is necessary to produce a study of economic feasibility, and a finding that the ratio between anticipated annual net revenues and annual debt service affords adequate debt "coverage" to satisfy requirements of the bond buyers and bond attorneys. Under properly controlled circumstances, it is difficult to see the reason a referendum is requisite to revenue bond issues. Administrative review by a State agency would appear to offer sufficient control.

Tax Levies - Water and wastewater systems are customarily financed on a "utility" rather than a "governmental service" basis. Counties, cities and districts in Colorado are, however, authorized to levy taxes within certain limitations for the acquisition, extension and operation of water and wastewater facilities. Provided levies are adequate, realistic, and continuing, this may be an appropriate and effective means of financing these facilities. It does raise basic questions of equity in that those taxpayers may already benefit from, or may not be scheduled to benefit from, the facilities, or that property tax evaluations are not appropriate measures of benefit received. This question of equity may thus raise possible questions of political feasibility.

Surplus Funds or Earmarked Revenues - The use of surplus funds or of earmarked non-tax revenues generally avoids problems of political feasibility, if not equity, but the more basic question is whether such funds can be amply provided on a continuing basis to implement the desired program of facilities and services.

Utility Operating Capital - Most water and wastewater systems are operated as self-supporting utilities, with the term "self-supporting" defined as producing annual revenues sufficient to meet operating costs, debt service requirements, and annually-recurring system extensions and improvements.

This practice has much to commend it. It does require schedules of rates and charges at a sufficiently high level to finance needed extensions and other capital improvements in addition to operating expenses. In a community that strives to keep rates low, perhaps to induce industrial development, such a practice may not be deemed politically desirable. Forthright policy decisions are required to maintain balance between community needs, goals, and financial burden.

These financial forms might be considered in the light of various types or classes of system expenditures.

Fixed Plant - For purposes of this section, "fixed plant" will refer to treatment plant facilities and appurtenances, and major pumping facilities, interceptors and outfalls. The construction, acquisition or expansion of such facilities is normally financed by bond issues because of their high cost and relative permanence. State statutes prescribe maximum periods for which bonds may be issued, generally related to the expected life of the improvement. Some students suggest that, in rapidly growing areas, the maturities should be related to the period of adequacy of the improvement rather than to its useful life, to avoid pyramiding debt.

Replacements and Upgrading - Portions of the system must be replaced from time to time because of physical depreciation, obsolescence or inadequacy. This may constitute a major one-time expenditure or perhaps may be anticipated and spread over a period of several years. When the total outlay can be foreseen as substantial, the question may arise as to whether the financing should be from bonds or from system revenues. Questions of equity as between present and future customers can be raised and, likely, can only be resolved within the context of all present and anticipated future demands upon customers. The plan which appears most fiscally sound, and which avoids interest costs and (theoretically) a perpetual utility debt, is to make orderly provision for replacement and upgrading out of current system revenues.

Extensions and Expansion - A distinction should be made between financing expansion of (or additions to) fixed plant, and expansion of the collection system through extensions. Fixed plant provisions are considered to be of general or system-wide benefit, and only in rare cases could a particular addition be directly related to specific users.

The collection system is of decidedly localized benefit. Although, in the case of a particular municipality or district, the basic collection system may have been initially financed by bond issue, the financing of extensions does not necessarily follow the same approach. Bond issues financed from pledges of tap charges, assessment collections, or other revenues, are frequently employed, but offer several distinct disadvantages. For one, they are more costly because of interest charges; for another, the tap charges and assessment collections, by law, can only be utilized to retire the debt. Finally, in a growing community, the frequency with which bonds must then be issued creates substantial administrative and legal expense and may cause some distrust of the bonds in the market. A sounder financial plan would appear to be that of providing for annually-recurring capital improvements from current revenues, through the process of creating a revolving fund for construction of extensions. From the fund, contracts are let for the extensions, and into the fund are deposited the proceeds from tap charges and assessment collections as the source of funds for future contracts. Some municipalities report that, with occasional "sweetening of the pot," a revolving fund can become self-perpetuating.

Operations and Maintenance - There should be no question that operating, maintenance and administrative expenses must be financed from a continuing source of current income. However, at least one instance was detected in this study in which operating expenses within a district were being partially met from tap charges, a one-time revenue source.

In the case of a general government providing the sewerage system, current operating expense may, and should, also include the appropriate costs for the utility's use of the general government's purchasing, accounting, legal or other services, including, for example, reimbursing the street department for pavement cuts. The utility should also be reimbursed for service furnished to the general government and its departments. "Current expense" should also include an appropriation or reservation of funds to meet possible contingencies or emergencies.

Fixed Charges - Fixed charges largely refer to principal and interest payments on debt. While sinking funds, or reserve funds, may be created from deposits of tap charges, assessment collections or other revenues, fixed charges are very decidedly current expenses which must be provided for as necessary or possible from current revenues.

Working Capital - Working capital may be defined as the excess of current assets over current liabilities. There is always a lag between the incurring of expense and the collection of revenues. The system user, or customer, in effect is always "in arrears." Funds must be available to meet necessary expenses in advance of the collection of revenues.

The same general principle applies in the case of making certain capital expenditures from current revenues, (for example, main extensions) in advance of collection of tap charges or assessments. Several of the wastewater agencies in the SMSA maintain capital reserve funds into which current revenues are appropriated as necessary.

Since the wastewater agency is, in effect, a monopoly, the amount of revenue which will be derived can, within limits, be planned in advance. Because frequent alterations in current rates and charges are not desirable, it is necessary to plan these revenues for at least several years in advance. This calls for projecting probable expenditures so as to estimate how much revenue will be required to meet current operating expenses and provide sufficient additional money to:

1. Meet working capital requirements
2. Meet debt service requirements
3. Finance fixed plant additions
4. Finance system extensions
5. Meet maintenance, replacement and upgrading costs
6. Meet emergency conditions.

Having made the estimates of revenue requirements, based on probable schedule of expenditures, the next step is to determine by what form and in what amount each class of user should be called upon to pay.

Recovery of Investment - Equity and financial soundness generally dictate that an investment, which directly benefits specific users or properties, be produced by or recoverable from those users or benefited property owners. Several typical measures might be cited.

"Cash on the Barrelhead" - No plan possesses the administrative simplicity and effectiveness of one in which, say, a land developer tenders cash in payment for the extension of a water and/or sewer line to serve his property. In practice, however, the apparent simplicity, fairness, and effectiveness may be questionable.

Such a plan might be attacked on the grounds that it tends to favor the rich while penalizing the poor who may have greater actual needs.

Further, such a plan cannot be considered to be comprehensive in scope in that it operates only when individuals appear with cash, and this hardly constitutes a "plan" for meeting needs or implementing programs on a broad scale.

Finally, there may be beneficiaries other than the individual producing the cash: property owners on the opposite side of the street or road; property owners by whom the extension is made along the route; property owners just beyond the affected property. Fairness dictates some recovery to the initial developer as these owners may actually utilize the service. The mechanics by which this recovery is accomplished may prove to be a cumbersome administrative procedure.

As an alternative to requiring cash, there may be contractual arrangements under which the developer repays the cost over a period of years. This procedure also becomes administratively cumbersome as the number of contractual agreements grows.

Recovery Through Rates and Charges - It is common practice to levy a charge for connection to the system, and this charge may be designed to cover not only the actual cost of making the physical connection but a portion of the benefit as well. Commonly, the "benefit" is gauged to be the cost of the required water and/or sewer main to serve the full frontage of the property. Additional charges may be levied, perhaps on an acreage basis, when the property is of such depth as to be suitable for extensive, multiple development.

The use of current revenues to produce funds for extensions has been discussed earlier. While these rates may be sufficient to finance the initial investment, it is not practical to assume that rates could continue to be so in a rapidly urbanizing area without there being some recovery from the user or benefited property owner.

Connection charges which provide for recovery of full cost may become quite large, and governing bodies frequently enact provisions that such charge is to be paid only when connection is actually made. This produces the marked effect of slowing or creating irregular patterns of land development, and thereby delaying recovery of the investment. Frequently, health regulations require that connection be made to the public sewer system when the property is within a prescribed minimum distance.

Parenthetically, fairly rapid recovery of system investment is essential to the making available of further funds for continuing extension programs.

Special Assessments - Cities and towns are authorized to levy special assessments against benefiting properties for all or part of the cost of the improvement. This is normally done on either a front-foot basis or an acreage basis, although it is not uncommon to establish a benefit district in which the total costs are apportioned among the properties within that district either equally or on the basis of property valuation or lot size.

Assessments constitute a lien upon the property, and may be paid over, say, a period of five years or of ten years at the option of the governing body. The governing body, if it so elects, may order assessments held in abeyance either for a period of time stipulated, or until the service is actually connected. It may also grant appropriate exemptions in the instance of properties having double frontages or other special circumstances.

The use of special assessments insures that all costs levied are ultimately recovered. Further, it affords equity among the beneficiaries (past, present, and future), encourages more orderly and uniform development of land, and provides a mechanism for the relief of temporary hardships.

REVENUE PRINCIPLES

A 1951 Joint Report of Committees of the American Society of Civil Engineers and the Section of Municipal Law of the American Bar Association, and representatives of various other professional organizations, found this fundamental principle:

> "The needed total annual revenue of a water or sewage works shall be contributed by users and non-users (or by users and properties) for whose use, need and benefit the facilities of the works are provided approximately in proportion to the cost of providing the use and the benefits of the works."

Several traditional principles of utility rate structures might also be stated:

1. Each class of customer should contribute to revenues in proportion to the relative cost of rendering service to that class;
2. Rates should be designed to produce maximum net revenues;
3. Rates should be designed to promote the use of utility services;
4. Utilities are ordinarily enterprises with increasing returns at decreasing unit costs.

The remainder of this section will focus primarily on the first principle cited above, which is, in effect, embraced by Section 204 of the 1972 Amendments to the Federal Water Pollution Control Act. However, those same Amendments contest the current validity of No. 3, by calling for alternatives such as pricing or incentives which would reduce the volume of wastes and use of the service. Finally, it should be noted that principle No. 4 holds true only up to the point of maximum capacity, a point being constantly reached or exceeded in most wastewater treatment facilities.

Service Charges - It is suggested herein that service charges, based upon usage, should be the predominant, if not sole, source of system revenues to meet current administrative, operating, maintenance and working capital requirements for the collection, treatment and disposal components of the wastewater system. In the design of the service charge, it should be made sufficient to meet programmed, annually-recurring capital expenditures such as replacement and up-grading, main extensions, and equipment, as well as appropriate reserves for future improvements. The service charge should also supply necessary funds and reserves for principal and interest payments on system-wide improvements.

The levy of a sewer service charge based upon metered water use is by far the most equitable for most utility users, and should be utilized wherever possible. Cost factors for water and wastewater services are not necessarily similar, so that a charge based upon water usage (rather than a percent of the water bill) should be more equitable, at least in theory, even if more difficult from an administrative standpoint.

It should be noted that several of the sampled agencies base sewer service charges on the volume of metered water use during the winter months. This has been done to recognize, or to overcome the objections of, users who use large quantities of water in summer months, perhaps in watering lawns, which is not placed into the sewer system. To the extent that metered winter use is representative of year-round demand upon the sewerage system, and equity and accuracy thus achieved, (and if water conservation is no problem), no quarrel could be raised in the application of this formula to domestic users.

Where flat rate charges must prevail, a charge based upon occupancy and type of use would appear to be more equitable and realistic than one based upon floor area or number of fixtures. The charges must be simple to administer, so that limited variables can be employed. Every effort should be made to insure that flat charges become replaced by metered charges for all users, with non-domestic users being required to be metered as to flow and loadings.

In the derivation of service charges, many inequities can be reduced. For example, certain system costs, (such as billing, accounting, etc.) are the same for each customer regardless of use, and can be spread as "customer charges" among all the users. Other costs, such as the demand a user might place upon the system, can be represented by minimum charges based upon size of connection. Finally, certain costs are occasioned by the volume and composition of wastes actually placed in the system.

In allocating costs among "classes" of users, it is suggested that the traditional classes of "domestic," "commercial" and "industrial" may no longer provide realistic or suitable distinction. Once the basic "customer" charges have been spread among all users equally, additional charge components should be based upon "demand" (size of connection), and the volume and composition of waste. A "commercial" user, or a warehouse ("industrial"), does not inherently place greater burden upon the wastewater system than a "domestic" user, other than the potential demand which the size of connection might reflect. Here again, the Standard Industrial Classification Manual may offer guidance. Rigid, local control of connection sizes can also assist in insuring appropriate allocation of burden.

Tap Charge - It is reasonable and proper that the user pay the cost of connection from the service main to his property. Because the actual cost of each connection will differ (because of distance, depth, soil or rock conditions, etc.), most agencies develop a flat rate connection charge, based upon size of connection, which represents the average cost of materials, labor and equipment in making such connections, and provides for reimbursement to the agency in this amount. For cost control and for financial administration, it is suggested that this "connection charge" be separate and apart from any other "tap" charges. A "permit fee," for inspecting the house connection, might also be separated, so as to represent the cost of making that inspection. With these charges separated, we may now examine the design and application of the "tap charge" as it relates to provision of sewer service.

As noted earlier, the tap charge is a one-time charge, usually required cash-in-full, which represents the cost of the addition of a particular property to the wastewater system users. It has one known and obvious component: one-half the cost of constructing the sewer main for the frontage of that property (assuming the opposite frontage will also be charged). The size and cost of the main actually constructed may be greater than that actually necessary to serve that particular group of users.

Most agencies base charges passed on to the user on the size of a standard main (say 8" for residential service) and absorb the added cost of "oversize" mains required to serve system-wide needs.

In the instance of a new user connected to a system financed by revenue bonds, the terms of a revenue bond resolution may also require that the tap charge include a one-time payment for the proportionate share of fixed plant, system-wide facilities which were concurrently or previously constructed and on which bonds are outstanding. (The context in which this is prepared assumes that debt retirement for fixed plant is desirably financed from service charges rather than tap charges.)

There are other costs which directly or indirectly the user will occasion, e.g., pumping, maintenance, treatment, and administration. He may contribute to the necessary subsequent enlargement or expansion of fixed plant facilities. The first of these are operating costs, the proportionate share of which will be paid in service charges.

The proportionate share, or the basis for deriving that share, of future capital costs is extremely difficult to establish. Practical or even ingenious financial practices may require that a cash contribution be exacted from each new property served as a hedge against future capital outlay requirements, but it would seem more reasonable to establish service charges at a sufficiently high rate to derive the needed funds from each user, but in accordance with usage or continuing burden placed upon the system.

It is suggested herein that in a model revenue system the "tap" charge might be replaced by a "frontage" or "acreage" charge directly related to the apportioned user cost of collection facilities only. Thus the frontage charge and the special assessment for main extensions would be identical in derivation and effect, differing only in their administration.

Special Assessments - It has been noted previously that special assessments may be applied to main extensions only, or may be applied to district-wide improvements which may include interceptors, pumping stations or other special features.

Only one point need be made about the use of special assessments. While Colorado law provides that rates and charges, as well as assessments, constitute a perpetual lien against the property until paid, special assessments appear to offer two distinct features as a device for recovering investment:

1. The assessment can be levied so as to immediately attach to all property benefited, without regard to when connection may actually be made. This permits the agency to recover its investment more quickly, and will likely cause more orderly and consistent development of the benefited property parcels.

2. The assessment can be levied to be payable over a period of time, with interest. This affords the less-affluent property owner the option to arrange payment schedules to fit his means.

Whether the agency shall seek to recover all or only a portion of the costs of main extensions is a policy question for its governing body. Many agencies, in other parts of the nation, levy assessments at full cost but not to exceed a stipulated rate per front foot (usually less than actual cost expected). The result is that the rate actually levied becomes uniform throughout the jurisdiction, which is much more understandable and acceptable to the beneficiaries.

New Subdivisions - To reduce the financial outlays required of an agency, many are requiring the developers to install water and wastewater facilities throughout the development, to the specifications of the agency, and to dedicate these to the agency as a condition to receiving service. Developers frequently also find this a convenience, when the financial limitations or other commitments of the wastewater agency do not permit meeting the developer's desired schedule.

Usually this is accomplished under some form of contractual agreement, which may include some provision for the developer to recover portions of his costs. Care should be taken to insure that the financial commitment of the agency to that development is equal to, or no greater than, its comparable commitment if the agency constructed the improvements and collected charges from the beneficiaries.

Tax Levies - It is quite apparent that there are community-wide benefits resulting from the provision and operation of a sewerage system. Certainly these benefits are experienced in the maintenance or enhancement of property values and usefulness. The alert County Assessor will be adding an increment of value to a previously unsewered property instantly upon taking notice that sewers have been installed.

Assuming that the property owner has paid for this added increment of value once, through frontage charges, there is no clear reason why the wastewater agency should benefit from the added tax valuation. If the agency needs additional funds, it should increase its service charges, both as an alternate to increasing tax levies and as a fairer and more direct means of apportioning those revenues.

There are obviously occasions in the life of a struggling new wastewater system when revenues derived from its operations will not be sufficient to meet its requirements. These circumstances are recognized in the statutes, and tax support is authorized.

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There are obviously occasions in the life of a struggling new wastewater system when revenues derived from its operations will not be sufficient to meet its requirements. These circumstances are recognized in the statutes, and tax support is authorized.

There would appear to be no case which could be made for direct tax support, even for system-wide improvements or benefits, other than for emergencies, unless it could be demonstrated that tax value was truly a measure of the burden upon, or benefits from, the wastewater system.

It is strongly suggested, however, that the guarantee of tax support (or full faith and credit) should be uniformly accorded wastewater debt obligations, including revenue bonds, purely to secure the more favorable interest rates.

Other Taxes and Revenue Support - Struggling wastewater agencies (and other governmental units) frequently look longingly toward other special levies, such as alcohol or tobacco taxes, sales taxes, etc., as a means of additional financial support. If the relative needs and priorities for the total community permit assigning these revenues to the wastewater system, no fault could be found. However, the assignment of such revenues should be regarded as temporary "windfalls," and devoted exclusively to capital improvements.

Section VI

ALTERNATIVE INSTITUTIONAL FORMS

There exists in Colorado law a substantial body of enabling authority for the organization of areas for the provision of water and/or wastewater services. Areas and units of government have a wide range of options for selection of institutional form. These begin with the municipality and its authority to exercise its corporate powers in the provision of necessary services, the construction, operation, and maintenance of sewerage system, the extension of facilities to provide services outside the municipal boundaries, and to insist upon annexation as a condition of service.

County governments may also exercise statutory powers in the construction and operation of sewerage systems both within and beyond their boundaries. Sanitation districts may be formed to establish sewerage systems, to include or exclude portions of municipalities, and as an alternate institutional form which may be utilized by cities or counties to establish such systems.

Other forms of district organization for wastewater management, authorized in the statutes, include Metropolitan Districts, Metropolitan Sewage Disposal Districts and, most recently, the urban or regional Service Authority.

There is also ample authority for exercise of joint powers on a contractual basis, whereby two or more units or agencies (including districts) of government may join together for the common provision and administration of necessary or proprietary governmental functions, including waste collection and disposal.

Following is a brief review of the powers of various units and agencies of government to perform wastewater management functions.

City Governments

While Colorado is known as a "strong home rule state," its cities remain "creatures of the legislature." An 1891 Colorado State Supreme Court decision (City of Durango vs. Reinsburg, 16 C-327, 26 P. 820) which still stands, found that a "municipal corporation can exercise only such powers as are granted to it by its charter or the general laws of the state."

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Chapter 139 of the Colorado Revised Statutes prescribes the basic powers of cities. With respect to wastewater management, various Articles of that Chapter provide that cities may construct, lease, maintain, improve and extend sewerage facilities, both within and without the municipality, regulate the use thereof, including requiring connections to the system, require annexation as a condition to extension of service, and enter into joint construction and financing arrangements with other local or state public bodies. A 1920 Court decision (Mack vs. Town of Craig, 68 C-337, 191 P. 101), however, would appear to limit the authority of cities to exercise eminent domain outside their boundaries to acquire land or rights-of-way for sewerage facilities. The power to extend services outside corporate limits is deemed to be discretionary rather than a duty.

County Governments

County governments are also empowered to provide sewerage systems and facilities. Chapter 36, Article 29, of the Statutes authorizes counties, without referendum, to acquire, construct, operate, improve and extend sewerage facilities, both within and partially without the county boundaries. Counties may also enter into joint operating, construction and financing agreements with other governmental units, may require connections by inhabited properties within 400 feet of a sewer main, and exercise other broad powers in the operation and regulation of such sewerage systems. Added to county powers by the Special District Control Act (Chapter 89, Article 18) is the review, approval, conditioned approval or disapproval of the service plan of proposed special districts. Counties in 1970, by Constitutional Amendment, were also granted authority to adopt home rule charters.

Improvement and Service Districts

Four basic types of local improvement and service districts for wastewater management are authorized under Chapter 89 of the Colorado Revised Statutes.

Special Improvement Districts in Cities and Towns -

(Articles 2 and 4) Cities of any class may construct sewerage facilities to serve a specified district within their boundaries, order the construction of sewers to connect with the public sewer or with the disposal plant, require connections to the public sewers, and join with contiguous cities or towns in the construction and joint use of common sewers. The governing body of the municipality is the creating authority of the special improvement district.

Metropolitan Districts - (Article 3) Metropolitan Districts may be created "to secure for the inhabitants thereof any two or more" stipulated public services, among them the furnishing of water and sewerage systems. The district may be entirely or partially within or without one or more municipalities. The statutes provide procedures for the organization of districts upon satisfactory petition and referendum, and delineate their powers with respect to any existing district. The governing body is elected by the qualified resident electors. Metropolitan Districts have all the powers granted water, sanitation, hospital or other special districts when performing that specific function.

Water and Sanitation Districts - (Article 5) Water and sanitation districts may also be created upon satisfactory petition and referendum to provide water and/or sewerage systems. Under the Statutes, the District Court performs a monitoring function over districts and may, for example, order territory excluded from the district upon annexation by a municipality, if the municipality provides or agrees to provide comparable service. Districts may, but are not obligated to, serve property outside the district, and properties comprising the district need not be contiguous. The Courts have ruled that lack of a special benefit is not a basis for excluding property from a district, since districts are presumed to be created for the benefit of the entire community. The governing body is elected by and from the qualified electors residing in the district.

Metropolitan Sewage Disposal Districts - Article 15) The enabling legislation contains a statement of "intent and purpose that municipalities retain full power and authority" to provide sewer service to their inhabitants, and to authorize a district to intercept, receive, treat and dispose of the "outfalls" of the municipal sewer system from both within and without its corporate limits or as such may be expanded. A district may be composed of territory included within the corporate boundaries of two or more municipalities, which need not be contiguous. The district is designated as the exclusive agent for the purposes and area for which it is created, and no treatment or disposal facilities may be acquired or improved without its approval.

Action to create a district may be initiated by ordinance by the governing body of any municipality, setting forth various particulars including the names of other municipalities proposed for inclusion. Only such municipalities as favorably respond by affirming ordinance may be joined in the district. The district possesses quasi-municipal powers, rights and immunities, including power of eminent domain. Its governing body (Board of Directors) is composed of representatives named by its member agencies, apportioned on the basis of population.

Special District Control Act

Chapter 89, Article 18 of the Colorado Revised Statutes provides that the petitioners for any proposed special district shall file a service plan with the county commissioners of the county in which the district is proposed. This plan shall contain a financial survey and preliminary engineering data showing how the services are to be provided, together with a map of the proposed district, population and assessed valuation contained therein, proposed facilities,construction standards, cost estimates, and details of arrangements and agreements with cities, towns or other districts.

The board of county commissioners, after public hearing, may approve, disapprove or conditionally approve the service plan. Specified criteria for disapproval include a finding that there is insufficient existing or projected need, that adequate service is or will be available through extensions by other agencies, that the proposed district is incapable of providing economic or sufficient service or lacks financial capacity, or that the proposed facilities and service standards are incompatible or inadequate. A resolution by the board of county commissioners approving the service plan is a requisite to the district court calling an election on the question of formation of the proposed district. This legislation, not enacted until 1965, is an important means of control of the spread of special purpose districts.

Joint Powers

Chapter 88, Article 2, provides that any one or more local governments may contract with any one or more other local governments for the performance of any governmental service, activity or undertaking which each of the local governments entering into the agreement is authorized by law to perform. "Local government" is defined as any county, city, town, special improvement district, water or sanitation district, or "any other kind of district or political subdivision". Thus wastewater management functions can clearly be performed under whatever contractual basis with whatever unit of local government is deemed most appropriate. This could involve the joint planning, engineering, construction, financing and staffing or management of wastewater facilities. Thus the joint management agency, joint planning agency, or management contract institutional approaches would all appear to be authorized.

Regional Service Authority (Chapter 89, Article 25)

The Colorado Service Authority Act of 1972 followed as a direct result of the 1970 State Constitutional Amendment on local government. The Denver Regional Council of Governments has prepared an analysis of this Act under a DHUD grant, entitled "An Approach to Regional Services," May, 1972. It terms the Regional Service Authority as "a new form of government designed especially to provide a number of specified services on a regional basis, but without granting the usual law-making powers normally associated with general purpose governments." How these functions are desirably separated is not made clear.

The Service Authority is regarded as an alternative institutional form of major promise. The DRCOG report notes that its purpose "is to provide for the more efficient delivery of those services, or portions thereof, which best lend themselves to regional administration." While city or county governments would not be replaced, the opportunity is offered for absorbing and reducing the number of small, single purpose districts, at the option of the voters. A service authority may be created only with voter approval as to territory and services; the governing body "directors" are also subject to district election. The Act provides that any service authority created within the Denver area must contain all of the territory of City and County of Denver and all or portions of the Counties of Adams, Arapahoe and Jefferson.

Private Utility

An individual, company, or corporation may establish and operate water and sewerage facilities, subject to state laws regulating public utilities, state health laws and regulations, and to findings that public services and facilities are not reasonably available. Several private or cooperative utilities exist in the study area, but none were included in the sampled agencies.

Direct State Action

Although not now provided for by law, the Colorado General Assembly might create a state agency (perhaps similar to the Maryland Environmental Service) with broad statewide powers to construct, acquire, operate, or intervene in the operating of proposed or existing wastewater treatment and disposal facilities. Alternatively, the General Assembly could create one or more regional authorities within which these functions would be directly performed by the State.

State grant funds for capital improvements might then be authorized and channeled through such agencies to facilitate conformance with established plans or criteria.

Federal Study Finding

The Environmental Protection Agency Study, National Capital Region Water and Waste Management Report, April, 1971, an investigation of similar problems in the Washington Metropolitan Area, found that "major obstacles to these problems are institutional and financial rather than technical or engineering." This report saw major weaknesses, including "continuing reluctance to recognize relationships between land use and development policies...and established environmental quality goals,"..."separation of water supply and waste management programs,"..."uncertain...arrangements to provide the funds...required...for construction of new facilities...and...upgrading, and lack of authority...to achieve adherence to regional priorities and plans."

The report also found that "a major issue in creating new institutional arrangements to correct these weaknesses is the question of the level of government at which these arrangements should be established and controlled."

While related specifically to the District of Columbia Region, from among various alternatives the report tended to advocate:

1. A Regional Council for comprehensive planning and policy decisions;

2. An area-wide governmental corporation (Environmental Service Corporation) for water supply and waste management functions.

Organizational Criteria

In the evaluation and selection of institutional form, recognition of certain basic criteria, such as the following, may be useful:

Comprehensive Jurisdiction - The selected arrangements should provide an organization (or organizations) with clearly defined authority to plan and provide facilities throughout the prescribed service area. The jurisdiction, program and organizational capacity should desirably be equal to the scope of the problem.

Administrative Simplicity - The task of wastewater management will likely be a public responsibility. Therefore the organizational arrangement should be one which is responsible and ultimately accountable to the citizens of the area in an appropriate manner, and its policies, procedures and programs established in a manner permitting full public review and knowledge.

Financial Capacity - The selected arrangement should be one which affords the capacity to derive adequate revenues, and with flexibility in financing arrangements as necessary to meet changing conditions, and the responsiveness to assure equity among present and future users and taxpayers. The organization should also possess the authority and working capital to undertake limited investments in facilities required to serve the health or welfare of the area or its development, even on a risk basis.

Cooperative Plan- and Policy-Making - Water and wastewater services are necessary to urban development, but so are a number of other public services such as health and housing inspections, streets and highways, solid waste collection and disposal, fire and police protection, and zoning and development controls. Decisions on water and wastewater facilities are not unrelated to these activities, and the selected arrangements, therefore, should assure the necessary coordination in the comprehensive planning as well as the provision of all these public services. Arrangements for wastewater management should not impair the orderly extension of other urban services nor of municipal boundaries, nor should these actions unreasonably commit, or fail to provide, necessary wastewater facilities.

Operational Coordination - Wastewater construction and operations require coordination with other public services at the operational level, particularly with such services as water supply and distribution, storm drainage, streets and highways, and electric and gas utilities. The selected arrangements should recognize this need and facilitate the necessary coordination.

Institutional Flexibility - The organizational arrangement should not perpetuate an institutional form which may itself become outdated and unable to respond to future conditions and circumstances which cannot be fully anticipated. The arrangement selected should therefore be one which can be appropriately adapted or modified as changes in scope or magnitude of its program may occur.

Dependent upon circumstances, some of these criteria or characteristics may be deemed more important than others. Further, no particular arrangement will be likely to fully satisfy all criteria. Obviously, the wastewater function cannot be regarded independently. As the U.S. Advisory Commission on Intergovernmental Relationships has stressed in a number of its reports, wherever possible wastewater (and Water) services should be provided by general purpose governments.

In considering alternative institutional forms, a logical division might be made between the two principal wastewater functions: collection; and treatment and disposal. Collection is largely local in nature, while treatment and disposal involve the centralized handling of area-wide wastes.

Collection and treatment also represent two principal needs now being faced by the SMSA:

1. The need for timely extension of collection mains to new or presently unsewered developments, to avoid public health problems attendant to or arising out of individual provisions by homeowners;

2. The provision of treatment and disposal facilities to meet increasingly higher standards for effluent control.

Following is a brief discussion of possible handling of wastewater functions under alternate institutional forms.

Cities - Within the urbanized or urbanizing fringe areas of municipalities, the extension of municipal collection systems is by far the most logical of physical arrangements. This avoids the duplication of facilities, staff and organization, and tends to advance the single urban character of the area. To those who subscribe to the maxim that "whatever is urban should become municipal", the taking of any steps toward full urban services and ultimate annexation would be viewed as rational and desirable. The control by the municipality of the location and extent of extensions offers control by the municipality of growth patterns and development standards outside its corporate limits. In a dynamic urban setting the municipality is constantly faced with plant upgrading, additions or relocation. The economics of plant construction and operation, difficulties in locating suitable sites, the likelihood that the plant(s) will not be located within the corporate limits, and the problems of sludge processing and disposal, all give some suggestion that treatment has regional connotations.

Counties - Outside municipal boundaries, county governments could perform valuable functions, not now being performed, within a range of possible institutional roles, including:

1. Construction, operation and maintenance of collection systems and/or treatment facilities;

2. Construction of facilities, but with either dedication of facilities or contractual arrangements with the municipality for operation and maintenance;

3. Serve as an interim financing agent for extension of facilities by the municipality into the county area.

While the term "municipality" has been employed above, a county role with respect to extensions beyond sanitation district boundaries would be equally appropriate.

This is not to suggest that County governments should create county sewerage systems, or that County resources or jurisdictions are equal to the task, but that the enabling authority might beneficially be utilized in special circumstances. In the overall planning context it should be recognized that county boundaries are no more magical than municipal boundaries when considering the scope of the problem or the configuration of a particular drainage basin.

Sanitation Districts - In relatively isolated developments, the sanitation district device has been useful in providing sanitary sewer service where other public sewer service is not reasonably available. In addition to other characteristics and possible shortcomings of special districts which might be noted, it should be observed that the principal financial base of districts is that finding of economic feasibility which permits the sale of revenue bonds, and which provides protection to the bond holders. This causes districts to be, by necessity, unresponsive to those needs for service on which full and timely return on the investment is not assured. Thus the special-purpose district device can be viewed as possessing only limited application to needs arising from urbanization, in terms of both responsiveness and capability for furnishing full urban services.

Metropolitan Districts - The metropolitan district has much of the same limitations as the sanitation district. It does offer opportunity for organized adjacent communities to join together for two or more common purposes, or for unorganized communities to provide for themselves the services of a limited purpose district. In the former case, however, another level of government is created, whereas the services and facilities might have been provided under the "Joint Powers" act. Therefore limited application is also seen for the Metropolitan District in meeting wastewater needs.

Metropolitan Sewage Disposal Districts - In wastewater treatment and disposal, MDSDD #1 is the current major example of such a district, with a record of demonstrated competence and effectiveness in its operations. How many districts, or how many treatment facilities, are desirable within a given metropolitan area, is beyond the scope of this study. Several observations might be made, however, based upon current experience.

Because a Metropolitan Sewage Disposal District has little or no influence or control over the planning or provision of collection systems, and the growth which occasions them, such districts tend to become merely "receivers" of wastes - in whatever volumes or compositions, and at whatever times the member agencies may deliver. On the other hand, certain member agencies report a difficulty in planning for the growth of their areas (and collection systems) because of the uncertainty as to the schedule or configuration of the district's physical plant expansion. Founded or unfounded, this somewhat awkward system of "checks and balances" should be refined by appropriate administrative and planning mechanisms.

Regional Service Authority - This institutional form has not yet been employed, but does hold much promise. As noted previously, it does not replace city or county governments, is not a "super" government, and possesses no law-making function. It can perform comprehensive planning, but can only implement and effect plans relating to its specified services. The continued divisions in responsibility for planning and implementation for those services, and that for other services performed within the service area, is to continue one of the problems now besetting the SMSA.

The regional service authority is intended to supply a scale of operation, however, as well as a step toward comprehensiveness. Therefore it is unlikely that the service authority would be created to merely construct service mains in city streets or to reach out to pockets of development which were unsewered. Assuming that a service authority was found to be the most logical agency to, say, maintain all water and sewer mains or staff all treatment plants within a given area, then it might likely have the staff and equipment to perform more localized functions as well. Given these broad functions, the service authority could, in theory, continue to observe local jurisdictional policies for provision or extension of service. In practice, however, it is inevitable that authority-wide policies would soon have to be drawn for uniform application throughout the area.

Joint Powers - None of the agencies in the sample reported effective use of the enabling authority contained in the "joint powers" legislation. It is believed that the smaller districts and municipalities in particular would benefit from exploration and use of this authority. Accordingly, it is recommended that the DRCOG initiate studies to identify candidate agencies and the appropriate form for undertaking the exercise of these powers.

A joint management contract could offer many benefits. Such a contract could provide for joint administration, accounting, budget preparation and execution, billing and collecting, public information services, etc. Such a contract might subsequently be extended to include maintenance of facilities, operation of plants, procurement of engineering services, supervision of construction, or other services.

The authority of the respective boards of directors or other governing bodies would have to be clearly preserved. This can be insured, however, under a variety of management forms, such as: an existing agency performing services for fellow agencies; a new "service bureau" agency collectively formed by the contracting agencies; agencies entering into management contract with a private firm, etc.

The benefits of such arrangements are foreseen to be increased efficiency and effectiveness, decreased costs (at least decreased unit costs), and introduction of technical and management capability not otherwise available to the agencies acting individually. Finally, such an undertaking, properly staffed, would doubtless be more responsive to both user and agency needs.

Regional Planning - The institutional forms for multi-jurisdictional or regional provision of wastewater facilities all provide for a planning function to be performed within that institutional form. Given the condition that a district or service authority will perform only a few functions which may not be performed throughout the entire area, the need will continue for mechanisms to achieve coordination of plans and programs throughout the area.

The Denver Regional Council of Governments has performed an important and valuable role in the Denver SMSA. It is not, nor was it intended to be, an operating governmental agency. It is a voluntary association of local governmental units, although organized under enabling state legislation. Nevertheless, the DRCOG has certain status and performs certain functions in the SMSA which directly relate to wastewater management:

1. It is the officially-designated planning agency for water quality management planning;
2. It is the officially-designated A-95 review agency for all federal grant programs;
3. It is the official representative of the State Water Pollution Control Commission for review of proposed treatment plant sites;
4. It has an active on-going planning program, and a substantial inventory of vital data relating to the region;
5. It provides an active forum for discussion of technical and policy matters of concern to the region and its agencies, and for consideration of cooperative approaches to common problems.

Whatever institutional arrangements may be selected, no matter how sweeping, the DRCOG would appear to remain as a desirable and necessary agency, continuing its role as an independent association of units of government but, by its nature, closely involved in all inter-governmental unit concerns.

There are other regional planning forms available. For example, Chapter 106, Article 2, of the Colorado Revised Statutes provides that county commissioners may provide that a regional planning commission may perform the functions of a county planning commission. Among those functions is the review of proposals for wastewater facilities and services to be established in new developments. Conceivably a "regional planning commission" within the Denver SMSA would be the DRCOG, but the Act does not so stipulate and another level of planning could be created. In such instance, it may be desirable to seek a division in planning responsibilities, distinguishing between those functions and activities defined as "regional" and those tending to be more local in nature and concern.

Regulatory Agencies

The Colorado Water Pollution Control Commission is the agency responsible for water pollution control activities and enforcement in the state. The Commission promulgates rules and regulations which are administered by the Colorado Department of Health, primarily through its Water Pollution Control Division. The Water Pollution Control Division has, in turn, delegated water pollution control planning responsibilities within the Denver SMSA to the Denver Regional Council of Governments.

On the local levels, several regulatory agencies have active programs in water pollution control activities:

1. Water Pollution Control Division, Environmental Health Service, Denver Department of Health and Hospitals
2. Boulder City-County Health Department
3. Jefferson County Health Department
4. Tri-County District Health Department (urbanized areas of Adams, Arapahoe and Douglas Counties)

The programs of these agencies include such activities as identifying and mapping pollution sources, developing and insuring compliance with abatement measures, issuing permits for septic tanks or package plants when connection to public systems is not feasible, and performing inspections, laboratory investigations and monitoring programs.

State Action

Should the state government engage in wastewater operations, it would likely be in the function of providing and operating treatment and disposal facilities rather than collection systems. The state could probably be expected to perform these functions at least as efficiently as a district, and could establish arrangements to insure local representation on the boards of direction. Given a failure on the part of local agencies to take necessary actions, the state might elect to directly intervene and take over those responsibilities. Unless there were substantial reasons for performing these functions state-wide, there would likely be reluctance to intervene in a single area. The Maryland Environmental Service, a state agency created in 1970, has, for example, been granted broad and comprehensive powers in wastewater management. It has taken a state-wide approach, undertaking the planning of a system of regional treatment and disposal plants. However, it is also taking steps to preempt construction and staffing of private or inadequately-operated public plants, utilizing its resources to finance, consolidate and operate such plants where necessary. MES is an operating rather than regulatory agency, however.

Direct Federal Action - Direct federal action would likely occur in multi-state areas where interstate compacts or cooperation had failed to meet the problem. It is not foreseen that direct federal action exists as an institutional alternative in the case at hand.

Summary

There is a more than adequate basis in Colorado law for creating institutional forms for wastewater management, and for insuring the coordination of wastewater planning and provisions with other functions. The selection of institutional arrangements becomes a choice for the citizens of the local units of government, based upon the nature and scope of need, resources which must be applied, and the perceived effectiveness and representative nature of the particular form.

No serious problems in financial arrangements are foreseen under the various institutional forms, although certain constraints and recommendations will be noted in succeeding sections.

Section VII

TOWARD A FINANCIAL PLAN

In the previous sections there has been considerable review of statutory provisions for institutional and financial arrangements, and of possible deviations from current practice which might clarify, simplify or render these financial arrangements more productive under alternative institutional forms.

The Denver SMSA is a diverse region, and the current practices and policies found therein have arisen under, or to meet, widely differing circumstances. It seems a fair statement to say that there are too many agencies attempting to furnish wastewater services within the SMSA, and that the financial capacities of many of these agencies are insufficient of themselves, or until joined with the resources of others, to perform the task ahead. These agencies tend to merely exist, rather than to plan and implement to meet goals.

It is to state the obvious to point out that a financial plan is an instrument in a vacuum unless it is designed to meet specified targets. The definition of these targets cannot be made unless there is a clear statement of goals, needs and priorities; an evaluation of the resources available; and some control over the circumstances influencing needs and resources, which means control over growth and development.

The people within the SMSA, through their existing institutions, are perfectly capable, and have full authority, to group themselves together under whatever institutional form they may choose. The statutes provide a wide range of options, which include consolidation of or annexation by general purpose governments, or formation, consolidation of or annexation by single or multiple purpose districts which parallel or cut across the jurisdictional lines of general purpose governments. Therefore, the financial plan, being but a means to achieve desired ends, is dependent upon the scope and scale of the institution to identify its needs and exercise meaningful control over the causes and effects.

To the extent that the Denver SMSA is a community, there exists a further need that the sum or thrust of the individual institutional actions will satisfy the total needs of that Denver "community". In this study, the question has frequently emerged as to whether, or to what degree, the

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proliferation of wastewater agencies will pertain attaining rational regional goals. To do so, requires physical and financial planning and implementation which are compatible. It further suggests that financial arrangements, while not necessarily uniform throughout the jurisdictions, must be consistent and complimentary if regional interests are to be advanced.

The financial plan (or plans) should contain these essential features:

1. Be based upon clearly enunciated goals, standards and policies;
2. Be directed toward the fulfillment of specified needs, the form of which has been determined after careful analysis of alternatives;
3. Recognize both capital and operating needs of the agency;
4. Provide for the timely production of revenue to meet those needs;
5. Apportion the revenue equitably among the various classes of users in accordance with burdens placed upon the system;
6. Insure sufficient financial stability as to not pose widely-fluctuating or frequent changes in financial burdens upon the users;
7. Possess sufficient flexibility to be revised as needs or circumstances may change;
8. Provide maximum economy and efficiency to its users and citizens;
9. Provide for budgeting, accounting, reporting and monitoring in a manner which reflects the cost of performing the various types of functions and services of the system;
10. Permit the agency to operate and meet its needs on a sound and self-sufficient financial base.

It has been earlier suggested that the financial, or revenue, measures basically be composed of:

1. Service charges, based on usage and composition of waste, in a total amount sufficient to meet

operating, maintenance, replacement, fixed charge, working capital and reserve fund needs;

2. Frontage charges, based upon the cost of providing a segment of collection system to serve or benefit the property;
3. Connection charges and permit fee, to cover the actual cost of that service;
4. Fiscal management practices, which seek maximum investment of temporarily idle funds, maximum discounts and most favorable price on purchases, and adequate cash flow to meet obligations;
5. Debt policies and practices, which provide for issuance for only major long-term improvements, at the most favorable interest rates, and at least cost of administration;
6. Full utilization of grant programs for constructing improvements.

To secure the most favorable conditions for financial management, it is suggested that:

1. The General Assembly place "sewer" or "wastewater" bonds in the same category as "water" bonds with respect to debt limitations;
2. The General Assembly create a category of water and sewer bond which is retired from system revenues but contains guarantee or pledge of full faith and credit in the event of default;
3. The General Assembly designate a state agency to supervise and provide financial advice and assistance in the preparation of bond issues, and in actual administration of local government bond sales;
4. The Colorado Water Pollution Control Commission establish and maintain a continuing data base on wastewater systems and their physical and financial operations;
5. The Auditor General develop and prescribe a system of accounts classification, budgeting and auditing for wastewater management to reflect cost and revenue categories in operations;

6. The Auditor General render assistance to wastewater systems in rate schedule derivation and review by establishing recommended guidelines, with appropriate reference to future guidelines of Environmental Protection Agency.

7. The General Assembly strengthen general County powers with respect to wastewater management;

8. The units and agencies make greater utilization of contractual agreements to provide common services, such as billing and accounting, laboratory testing, monitoring of flows, and operator training and staffing.

9. The Denver Regional Council of Governments continue and enlarge its function as a forum for technical, financial and planning considerations relating to wastewater management.

Under conditions of full regionalization, limited regionalization, or expanded jurisdiction of a more limited total number of wastewater agencies, - and on the assumption that federal grant funds will be available to finance major plant additions, - the utilization of available revenue sources and enlightened financial management would appear to be adequate bases for implementing the goals, plans and programs of the region.

Section VIII

ACKNOWLEDGMENTS

A study of this nature can only be as good as the information and insights provided by representatives of the studied wastewater agencies. Fortunately for this study, the officials of each of the sixteen agencies eagerly gave their time and support to this effort. We acknowledge this cooperation and give many thanks.

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Section IX

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